COMMONWEALTH OF PENNSYLVANIA.

DEPARTMENT OF AGRICULTURE.

BULLETIN No. 151.

# PROCEEDINGS

OF THE SPRING MEETING,

# STATE BOARD OF AGRICULTURE,

AND

# FARMERS' ANNUAL NORMAL INSTITUTE.

COMPILED BY A. L. MARTIN,
*Deputy Secretary and Director of Institutes.*

HELD IN THE

## COURT HOUSE, CLEARFIELD, PENNA.,

MAY 29 to 31, 1906.

HARRISBURG, PA.:
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1906.

VIRTUE
LIBERTY AND
INDEPENDENCE

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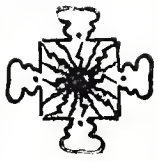
# PREFACE.

Commonwealth of Pennsylvania,
Department of Agriculture,
Harrisburg, Pa., July 3, 1906.

There is perhaps no source of information upon subjects relating to either practical or scientific agriculture that is so easily available as the Farmers' Institute, and whatever adds to the efficiency of these institutes is of paramount importance. The hope of increasing their usefulness to the farmers of the State, has led to the establishment of what is known as the Farmers' Normal Institute, in which all institute managers and lecturers of the State come together once a year for consultation and instruction.

In order that the instruction given at these institutes may be available to the greatest possible number, this Department publishes in bulletin form their proceedings, and so we send out the following bulletin, No. 151, containing the full proceedings of the Normal Institute held at Clearfield, Pa., May 29 to 31, 1906, in the hope that it may prove helpful upon the many farms and in the many farmhouses to which it may come.

N. B. CRITCHFIELD,
*Secretary of Agriculture.*



# LETTER OF TRANSMITTAL.

Commonwealth of Pennsylvania,
Department of Agriculture,
Harrisburg, Pa., June 30, 1906.

Hon. N. B. Critchfield, *Secretary of Agriculture:*

Dear Sir: I have the honor to present herewith, bulletin of the Seventh Annual "Farmers' Normal Institute" which was held at Clearfield, Pa., May 29 to 31, 1906.

Very respectfully,

A. L. MARTIN,
*Director of Institutes.*

# MEMBERS

OF THE

# PENNSYLVANIA STATE BOARD OF AGRICULTURE,

FOR THE YEAR 1906.

## Members Ex-Officio.

HON. SAMUEL W. PENNYPACKER, Governor.
MAJ. I. B. BROWN, Secretary of Internal Affairs.
DR. N. C. SCHAEFFER, Superintendent of Public Instruction.
DR. G. W. ATHERTON, President of The State College.
HON. WM. P. SNYDER, Auditor General.
HON. N. B. CRITCHFIELD, Secretary of Agriculture.

## Appointed by the Governor.

Gen. James A. Beaver, Centre County, ..... Term expires 1907
R. I. Young, Middletown, Dauphin County, ..... Term expires 1908
Col. R. H. Thomas, Mechanicsburg, Cumberland County, .... Term expires 1909

## Appointed by the State Poultry Association.

.....

## Elected by County Agricultural Societies.

| | | | Term expires. |
|---|---|---|---|
| Adams, | A. I. Weidner, | Arendtsville, | 1909 |
| Allegheny, | J. S. Burns, | Imperial, R. F. D. No. 1, | 1909 |
| Armstrong, | S. S. Blyholder, | Neale, | 1908 |
| Beaver, | A. L. McKibben, | New Sheffield, | 1908 |
| Bedford, | S. S. Diehl, | Bedford, | 1906 |
| Berks, | H. G. McGowan, | Geiger's Mills, | 1907 |
| Blair, | F. Jaekel, | 1013 10th St., Altoona, | 1907 |
| Bradford, | E. E. Chubbuck, | Rome, R. F. D. No. 16, | 1907 |
| Bucks, | ..... | ..... | ..... |
| Butler, | W. H. H. Riddle, | Butler, | 1906 |
| Cambria, | H. J. Krumenacker, | Carrolltown, | 1906 |
| Cameron, | W. H. Howard, | Emporium, | 1906 |
| Carbon, | ..... | ..... | ..... |
| Centre, | John A. Woodward, | Howard, | 1909 |
| Chester, | M. E. Conard, | Westgrove, | 1909 |
| Clarion, | S. X. McClellan, | Knox, | 1907 |
| Clearfield, | J. W. Nelson, | Shawville, | 1907 |
| Clinton, | J. A. Herr, | Mill Hall, R. F. D., | 1908 |
| Columbia, | A. P. Young, | Millville, | 1909 |
| Crawford, | J. F. Seavy, | Saegerstown, | 1908 |
| Cumberland, | Chas. H. Mullin, | Mt. Holly Springs, | 1909 |

| | | | Term expires. |
|---|---|---|---|
| Dauphin, | | | |
| Delaware, | R. M. Heyburn, | Ward, | 1908 |
| Elk, | John M. Witman, | St. Mary's, | 1908 |
| Erie, | S. D. West, | Wattsburg, | 1907 |
| Fayette, | | | |
| Forest, | C. A. Randall, | Tionesta, | 1907 |
| Franklin, | C. B. Hege, | Marion, | 1908 |
| Fulton, | R. M. Kendall, | McConnellsburg, | 1907 |
| Greene, | N. M. Biddle, | Carmichaels, | 1907 |
| Huntingdon, | Geo. G. Hutchison, | Warrior's Mark, | 1909 |
| Indiana, | S. M. McHenry, | Indiana, | 1907 |
| Jefferson, | W. L. McCracken, | Brookville, | 1907 |
| Juniata, | Matthew Rodgers, | Mexico, | 1909 |
| Lackawanna, | Horace Seamans, | Factoryville, | 1907 |
| Lancaster, | W. H. Brosius, | Drumore, | 1907 |
| Lawrence, | Sam'l McCreary, | Volant, | 1909 |
| Lebanon, | H. C. Snavely, | Cleona, | 1907 |
| Lehigh, | P. S. Fenstermaker, | Allentown, | 1909 |
| Luzerne, | J. H. Snyder, | Trucksville, | 1907 |
| Lycoming, | A. J. Kahler, | Hughesville, | 1909 |
| McKean, | S. B. Colcord, | Port Allegany, | 1906 |
| Mercer, | W. C. Black, | Mercer, | 1908 |
| Mifflin, | M. M. Naginey, | Milroy, | 1907 |
| Monroe, | R. F. Schwarz, | Analomink, | 1908 |
| Montgomery, | J. Sexton, | North Wales, | 1908 |
| Montour, | | | |
| Northampton, | W. F. Beck, | Easton, R. F. D., | 1909 |
| Northumberland, | I. A. Eschbach, | Milton, R. F. D., | 1908 |
| Perry, | A. T. Holman, | Millerstown, | 1907 |
| Philadelphia, | E. Lonsdale, | Girard College, Phila., | 1907 |
| Pike, | | | |
| Potter, | H. H. Hall, | Ellisburg, | 1909 |
| Schuylkill, | W. H. Stout, | Pinegrove, | 1906 |
| Snyder, | J. F. Boyer, | Freeburg, | 1909 |
| Somerset, | Jacob S. Miller, | Friedens, | 1908 |
| Sullivan, | E. R. Warburton, | Dushore, R. F. D. No. 3, | 1909 |
| Susquehanna, | E. E. Tower, | Hop Bottom, | 1907 |
| Tioga, | F. E. Field, | Wellsboro, | 1908 |
| Union, | J. Newton Glover, | Vicksburg, | 1908 |
| Venango, | August Morck, | Oil City, | 1904 |
| Warren, | R. J. Weld, | Sugargrove, | 1908 |
| Washington, | D. S. Taylor, | Racoon, | 1908 |
| Wayne, | Warren E. Perham, | Niagara, | 1907 |
| Westmoreland, | M. N. Clark, | Claridge, | 1907 |
| Wyoming, | D. A. Knuppenburg, | Lake Carey, | 1907 |
| York, | G. F. Barnes, | Rossville, | 1908 |

# OFFICERS.

## PRESIDENT.

Hon. Samuel W. Pennypacker, Governor, .....Harrisburg.

## VICE PRESIDENTS.

P. S. Fenstermaker, .....Allentown.
A. J. Kahler, .....Hughesville.
S. M. McHenry, .....Indiana.

## EXECUTIVE COMMITTEE.

Hon. Samuel W. Pennypacker, .....Harrisburg.
I. A. Eschbach, .....Milton.
H. G. McGowan, .....Geiger's Mills.
H. C. Snavely, .....Cleona.
Dr. E. E. Tower, .....Hop Bottom.
Sam'l McCreary, .....Volant.
J. Newton Glover, .....Vicksburg.
Dr. M. E. Conard, .....Westgrove.
N. B. Critchfield, *Secretary*, .....Harrisburg.

## ADVISORY COMMITTEE.

N. B. Critchfield, *Secretary*, .....Harrisburg.
A. T. Holman, .....Millerstown.
H. C. Snavely, .....Cleona.
I. A. Eschbach, .....Milton.

## CONSULTING SPECIALISTS.

| | | |
|---|---|---|
| Botanist, | Prof. W. A. Buckhout, | State College. |
| Pomologist, | Dr. J. H. Funk, | Boyertown. |
| Chemist, | Dr. William Frear, | State College. |
| Vet. Surgeon, | Dr. Leonard Pearson, | Philadelphia. |
| Sanitarian, | Dr. Edward Patrick, | West Chester. |
| Microscopists and Hygienists, | Prof. C. B. Cochran, | West Chester. |
| | Dr. Geo. G. Groff, | Lewisburg. |
| Entomologists, | Prof. H. A. Surface, | Harrisburg. |
| | Prof. Franklin Menges, | York. |
| Ornithologist, | Prof. H. A. Surface, | Harrisburg. |
| Meteorologists, | E. R. Demain, | Harrisburg. |
| | J. L. Heacock, | Quakertown. |
| Mineralologist, | Col. Henry C. Demming, | Harrisburg. |
| Apiarist, | Prof. Geo. C. Butz, | State College. |
| Geologists, | Col. H. C. Demming, | Harrisburg. |
| | W. H. Stout, | Pinegrove. |

# STANDING COMMITTEES.

## LEGISLATION.

Hon. A. J. Kahler, Chairman, ..... Hughesville.
Hon. Jason Sexton, .....North Wales.
Matthew Rodgers, ..... Mexico.
J. Newton Glover, .....Vicksburg.
S. S. Blyholder, .....Neale.

## CEREALS AND CEREAL CROPS.

S. X. McClellan, Chairman, .....Knox.

## ROADS AND ROAD LAWS.

D. A. Knuppenburg, Chairman, ..... Lake Carey.

## FRUIT AND FRUIT CULTURE.

John F. Boyer, Chairman, .....Freeburg.

## DAIRY AND DAIRY PRODUCTS.

R. J. Weld, Chairman, ..... Sugargrove.

## FERTILIZERS.

Howard G. McGowan, Chairman, .....Geiger's Mills.

## WOOL AND TEXTILE FIBRES.

D. S. Taylor, Chairman, .....Raccoon.

## LIVE STOCK.

Dr. E. E. Tower, Chairman, ..... Hop Bottom.

## POULTRY.

Dr. M. E. Conard, Chairman, .....Westgrove.

## FORESTS AND FORESTRY.

James M. Piatt, Chairman, .....Tunkhannock.

## APIARY

J. W. Nelson, Chairman, .....Shawville.

## FLORICULTURE.

Edwin Lonsdale, Chairman, .....Girard College, Phila.

## FEEDING STUFFS.

Prof. F. D. Fuller, Chairman, .....Harrisburg.

PROCEEDINGS OF THE PENNSYLVANIA STATE BOARD OF AGRICULTURE, AT A MEETING HELD IN THE COURT HOUSE, CLEARFIELD, PA., TUESDAY, MAY 29, 1906.

## ORDER OF BUSINESS.

Call to order at 10.00.

1. Roll-call of Members.
2. Reading of Minutes.
3. Appointment of Committee on Credentials.
4. Reception of Credentials of New Members and Delegates.
5. Report of Committee on Credentials.
6. Unfinished Business.
7. New Business.
8. Miscellaneous Business.
9. Adjournment.

Court House, Clearfield, Pa.,
Tuesday, May 29, 1906, 10 A. M.

First Vice President Fenstermaker in the Chair.

The CHAIR: The first thing in order will be the calling of the roll by the Secretary.

The Secretary called the roll, and the following answered to their names:

Messrs. A. I. Weidner, J. S. Burns, S. S. Blyholder, A. L. McKibben E. E. Chubbuck, H. J. Krumenacker, John A. Woodward, M. E. Conard, S. X. McClellan, J. W. Nelson, J. A. Herr, A. P. Young, J. F. Seavy, R. M. Heyburn, C. B. Hege, R. M. Kendall, Geo. G. Hutchison, S. M. McHenry, W. L. McCracken, Matthew Rodgers, Horace Seamans, W. H. Brosius, Samuel McCreary, P. S. Fenstermaker, A. J. Kahler, W. C. Black, M. M. Naginey, J. Sexton, I. A. Eschbach, A. T. Holman, H. H. Hall, W H. Stout, Jacob S. Miller, E. R. Warburton, E. E. Tower, J. Newton Glover, M. N. Clark, D. A. Knuppenburg, G. F. Barnes and N. B. Critchfield, *Secretary.*

The CHAIR: The minutes of the last meeting will be read by the Secretary.

The Secretary read the minutes of the last meeting and they were adopted as read.

The CHAIR: The Chair appoints the following gentlemen as a Committee on Credentials: Hon. J. A. Herr, of Clinton; M. M. Naginey, of Mifflin; J. S. Burns, of Allegheny; R. M. Kendall, of Fulton, and W. C. Black, of Mercer, who will meet at the call of the Chairman. Those having credentials for admission to this body will please come forward and present them to the Chairman of the committee.

While the Committee on Credentials is in session and preparing their report, if anybody desires to make a few remarks, we will be glad to hear from him at this time.

No one volunteering any remarks, the Chair declared a recess until the Committee on Credentials was ready to report.

After Recess.

The CHAIR: The Committee on Credentials has announced, through its Chairman, that it is now ready to report. The report will now be read.

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## REPORT OF THE COMMITTEE ON CREDENTIALS.

The Chairman of the Committee on Credentials, the Hon. J. A. Herr, read the report of the committee as follows:

Clearfield, May 29, 1906.

The Committee on Credentials make the following report: Lehigh County Agricultural Society sends the credentials of Mr. P. S. Fenstermaker, of Allentown, Pa., to represent them on the State Board of Agriculture.

Also, Centre County Agricultural Association sends the credentials of Mr. John A. Woodward, of Howard, Pa., to represent them on the State Board of Agriculture, in both cases, commencing January, 1906.

We find the above named credentials in regular form and recommend that the gentlemen be seated.

(Signed.)

J. A. HERR,
M. M. NAGINEY,
J. S. BURNS,
R. M. KENDALL,
W. C. BLACK.

MR. HERR: Mr. Chairman, I move that the gentlemen named be seated as members of the Board.

The motion having been duly seconded, and the question put, it was agreed to.

The CHAIR: The next thing in order is Unfinished Business.

MR. McHENRY: Mr. Chairman, I move you that we reconsider the vote by which we passed the report of the Legislative Committee at our last session, and when in order, I will give you my reasons for making this motion.

The CHAIR: You have heard the motion; are there any remarks?

MR. McHENRY: My reason for making this motion—it is only my own idea; perhaps no one else will agree with me, but my idea is that we made a mistake when we approved the proposition that all license fees be retained in the counties in which they are collected. I think under the existing conditions, that it was a mistake. I have not the figures to give you, but I will say, generally, that almost nine-tenths of the license fees are paid from counties in which the large cities are located, and are not our agricultural counties as a rule, and it takes that much money out of the State Treasury to which we must look for appropriations for schools, and for the improvement of our roads, and so on, and is scattered all over the other counties and all over the State. It may be a little selfish, perhaps it is; I don't know, but it may be so regarded, for Philadelphia, Pittsburg and those large cities, to throw their money into the State Treasury, as is usually done.

In my own county, license fees do not amount to very much, for it is almost altogether an agricultural county, and I venture the assertion that what is true there, is true in two-thirds of the counties in the State, if not three-fourths, and these are my reasons for making this motion; I merely want to know what the feeling of the members is.

There being no further discussion, the question was put by the Chair and agreed to.

MR. McHENRY: Mr. Chairman, I now move you to strike out the words "and the license fees." I move to amend that report by striking out those words.

A member called for the reading of that portion of the report as adopted. The Secretary read as follows: "We further recommend the enactment of the law whereby the personal taxes should be retained in the counties in which they are assessed, thereby relieving our overburdened taxation."

MR. HERR: I second the motion on the amendment. As I understand, the motion to reconsider prevailed, and the question before us now is on the adoption of the amendment.

MR. CLARK: Mr. Chairman, in reference to the personal tax, about all our personal tax is retained in the county. I do not think we send any tax out of the county except the State tax. Do not let us go on record and do anything here that is not right. It seems to me that the only tax we send out of the county is the State tax. Now the query with me is, whether the matter of the State tax is included as a personal tax. If you concede that that is a personal tax, of course that would include it; that is what I want to know.

MR. McHENRY: I did not include that in this motion. I thought it would come up in this discussion and I am anxious to have information on that myself—what is meant by that personal tax—whether it is a tax on money and personal property or just what it is that is paid into the State Treasury; if it is included, then I will include it in my motion to amend.

The CHAIR: There is a member of the Legislature in this body; probably he can enlighten us along this line.

MR. BROSIUS: Mr. Chairman, the personal property tax is paid now into the State Treasury, and our contention has been as agriculturists that we should retain that in our counties. I believe that our money at interest is personal property, and it should be, we think, retained at home. That has been my view. We pay no State tax to-day except a personal property tax, and that is properly money.

The SECRETARY: Mr. Chairman, will you allow me to inquire, through the Chairman, whether any part of that tax is returned to the counties now, or whether it is all returned to the counties?

MR. BROSIUS: I think there is a portion of it only returned to the counties. And now our contention, as to this resolution, if I am right—it is intended that it should be all returned. With our immense State revenue, it seems to me that should be done.

The SECRETARY: I understood Mr. Clark to ask the question whether it is not all returned to the counties now.

MR. CLARK: Mr. Chairman, what I spoke of was our personal taxes. Now money—the tax on money is not the only personal tax that we pay. We pay plenty of personal tax that never goes into the State funds at all. My query was this: What part of this tax do we want to include in this? It seems to me that we should amend it so as to include that part of the personal tax that is now paid into the State Treasury.

MR. HERR: Mr. Chairman, make that "personal property tax" and that will cover it, will it not?

The SECRETARY: If that were made "personal property tax" and the other should follow immediately after the words "personal property tax," the words "that are now paid into the State Treasury," that would make that very plain because that would be the tax assessed upon money at interest and nothing else. Now while you are amending this report, while the amendments are being considered, you can insert that, and that will make it all right and make it plain.

MR. KAHLER: Mr. Chairman, in regard to the question of the money returned to the counties, the object of this recommendation was that we retain it all in the counties. Now it seems to some of us that it is hardly worth while to pay money in and get money back. Why not leave it in? A great many of us think we are overburdened with taxation; that would help to balance it. We

have been trying to get some redress for local purposes and for some reason we have not been able to secure it. Now while we cannot get a whole loaf, our object was to get a little, and I for my part, am emphatically opposed to striking that out. I believe that there is a large sentiment in this State in favor of a proposition of that kind, that it all be retained in the county.

MR. BROSIUS: Mr. Chairman, I suppose that the gentleman must have misunderstood me. What I meant to be understood was, that I believed the State could well afford to do without it, with its immense revenue, and that it should be retained in the county, and the change, as I understand it, that this gentleman wishes, is that the license fees, etc., should be retained in the county.

My contention as a farmer is, has been, and is to-day, that we as farmers want to have all the benefit of all the money that is out at interest in our districts, and therefore that should not be changed. But it is a question with them there now. Of the license money collected, it is divided, and a certain amount goes to the county, a certain amount to the State and a certain other amount to the townships, but I really cannot specify the amount. Possibly the gentleman is right in regard to the distribution. Philadelphia and Pittsburg are large cities and have a great deal of license money, but I would not like to go on record as to that, but I think that the State with its vast income can afford, not only to let us have that, but to let us have a lot more.

MR. BOND: Mr. Chairman, I think that the proposition to retain the license tax in the county is very meritorious. I live in a county where the liquor license costs hundreds of thousands of dollars, and I believe that we should receive every dollar of that license back to help us to pay the expense of criminal cases that cost us hundreds of thousands of dollars that have to be paid out of our county treasury.

MR. McHENRY: Mr. Chairman, my sole object in having this sent to the State Treasury, is simply to equalize that money that comes from a traffic that does no one any good, and the only way you can equalize that over the State, is to let it go into the State Treasury, that comes from these counties that have been spoken of. I know that we do not get from Brother Bond's county, but we get this element that a bad influence has been exerted upon, from those counties, and we get that out in our agricultural counties, where we do not have much of that kind of a thing, and the only way we can get our share of it is to have it go into the State Treasury first and then have it paid back for road and school purposes. I am not certain that I am right; I think there is a certain portion paid to boroughs, whereas the townships in which a licensed hotel is located, receives very little benefit. I think that is the idea, as I understand it.

The SECRETARY: Mr. Chairman, that is correct.

MR. McHENRY: Now take it in my own county. We do not have but one licensed hotel that gives anything to the township, they are only in the boroughs and only in the cities, as a rule in

other counties, and I believe we make a mistake when we recommend our taking this fund and returning it again. As I said before, it may be slightly selfish, but I feel that it is doing no harm to get from the State all that we can get from the agricultural people. As I said, it may be slightly selfish to want to draw this large amount that comes from Philadelphia and Pittsburg and all those large cities that goes into the State Treasury. Now if we recommend this, and the Legislature passes it, it is done at the recommendation of the agriculturists themselves, and takes money away from them, as I know we do not have a very large amount compared with what we need. I thought it would be wise to take this up in order that it might be fully discussed.

MR. KAHLER: Mr. Chairman, I wish to say this, that while the gentleman objects to the money being retained in the boroughs and cities, he must recollect that we are not the only people that sacrifice. A great many people pay some of the taxes in these towns. As a rule, our towns are paying a heavier local tax than we are. Now why not retain that? The State is not in absolute need of it by any means; the revenues of the State are immense, and in a great many boroughs it is a material help to their local taxation to have this amount of money retained in their counties, and I think we should have it, for the traffic which costs thousands of dollars every year to defend criminal cases—that grows out of this traffic, and from which we get very little benefit.

MR. MILLER: Mr. Chairman, that don't really benefit the agricultural part of the county at all. We have in Somerset county probably three townships that have licensed houses and that pay a very small amount into the county treasury or into the State Treasury and I think fifty per cent. is returned. That amounts to very little in a township, and it is the boroughs where the licenses are paid and returned to them, that get the benefit, while the rural districts which help to keep up the saloons—they send their boys in to drink—and there is no return except misery.

MR HERR: Mr. Chairman, I think it is a misapprehension to talk about selfishness. I do not think that the benefits should be confined to the cities and boroughs instead of our rural districts, if benefits flow from these license taxes. I know that in our county we do not get a bit of it; the share of it that goes into the State Treasury should benefit us and I think we can with propriety ask for an increased appropriation for our school and road funds. It does not help us to pay costs of these criminal cases either. It is retained there as a borough fund, really, and not as a county fund. It is returned there, as I understand it, into districts in which the licensed houses are located; if that is so, it don't benefit our rural districts. Now it is an immense fund and I do not think you need to consider the interests of the boroughs and cities. I think they are quite able to take care of themselves.

MR. BOND: Mr. Chairman, isn't it the object of this motion to remedy that defect? Is it not the intention of that amendment to have the money refunded to the county treasurer? The resolution that has been passed in all meetings that I ever had any interest in

and the efforts that have been made in the Legislature, to have that law passed, with the intention of having it returned to the county treasury, and not having it returned pro rata to the townships and boroughs as the division is made now, is what I understand to be sought.

MR. MILLER: The resolution says that the whole of it is to be returned.

MR. BOND: To the county?

MR. MILLER: It would have to be returned to the place where it originated.

MR. HERR: My understanding is that it is to be retained rather than returned.

A Member: Mr. Chairman, would it not be well now to appoint a committee to get this in proper shape before decisive action is taken, rather than to go ahead and say something that will not sound well after you have said it.

The CHAIR: Are you ready for the question on the amendment to the report?

MR. CLARK: Mr. Chairman, will you kindly have the amendment read so that it will be understood?

The CHAIR: Will the Secretary please read the part desired?

The SECRETARY: Mr. Chairman, the report of the committee as it now stands under consideration reads as follows: "We further recommend the enactment of a law whereby the personal taxes and the license fees should be retained in the counties in which they are assessed, and thereby relieve our overburdened taxation."

The motion to amend was to strike out the four words "and the license fees" so that if the amendment passes it will read as follows: "We further recommend the enactment of a law whereby the personal taxes should be retained in the counties in which they are assessed and thereby relieve our overburdened taxation."

MR. SEXTON: Mr. Chairman, as I understand it, that resolution has already passed and we are discussing it after it has passed.

The SECRETARY: Mr. Chairman, for the benefit of Brother Sexton, through the Chair, let me say that the motion was to reconsider the vote by which the report was adopted and that motion prevailed, so that now this report is before us just as it was originally, and then the brother from Indiana county offered the amendment.

MR. BROSIUS: Mr. Chairman, if we adopt this amendment, it would stand in regard to licenses the same as it is to-day. Then we say nothing about the licenses and unless we would have legislation it would remain exactly as it is; that is my understanding of it.

The SECRETARY: Mr. Chairman, that is correct; the amendment will leave it just as it is now; the amendment as offered refers only to the liquor licenses.

The CHAIR: Is there any further discussion?

There appearing to be none, the Chair put the question, and a *viva voce* vote was taken which left the Chair in doubt as to the result, whereupon a rising vote was taken, the question being on the amendment to strike out the designated words, and the motion was lost.

The CHAIR: Now the question is on the adoption of the report of the committee. Those who are in favor of same will say aye, opposed no; it is carried.

The CHAIR: Is there any more unfinished business? If not, we will go on to New Business.

The SECRETARY: Mr. Chairman, under the head of New Business there is a matter that I would like to submit to the Board, and that is this: The act of Assembly provides that the election of officers shall take place on the fourth Wednesday of January at their meeting at Harrisburg each year. It has been customary to meet on Tuesday preceding the first Wednesday in January—am I right about that?

MR. HERR: Wednesday.

The SECRETARY: It has been customary, with but one exception, to meet on the fourth Wednesday of January. There are some people who want to hold their meetings at the same time; for instance, the State Live Stock Breeders' Association, in whose work we are all interested, and the State Dairy Union would like to hold their meeting the same week in order that they may have the advantages of the lecturers employed by the State Board, and that we may have the advantage of their lecturers employed by them, but if we meet on Wednesday, there would be only left four days of the week. They came to me and asked if we could arrange to begin our meeting on Tuesday, so that they might have a part of the time during the week, and I said to them in reply that it was not a matter for me to decide. I shall be pleased to have the matter taken up by the State Board or by the Executive Committee and I shall be glad to follow their instructions. I shall be pleased if the State Board or the Executive Committee will take some action in regard to this matter. I have had requests from the Dairy Union and also from the State Live Stock Breeders' Association asking that we begin our meeting on Tuesday. If we do we will have to put off the election of officers until the second day of our meeting. Those of you who were present then, know how we got along. This is a matter for you to consider now.

The CHAIR: You have heard the suggestion of the Secretary. Is there any motion?

MR. CLARK: Mr. Chairman, this matter has been mentioned to me quite frequently. Men who are very much interested in this question have spoken to me about it, and I can assure you that I

heartily wish that this convention may place it within the power of the Executive Committee or of the Secretary himself to call a meeting of the State Board of Agriculture on Tuesday, so as to give room for the other meetings to follow, and I do not know but it would be proper to make a motion to that effect to call a meeting on Tuesday.

MR. SEXTON: Mr. Chairman, does not the law fix the time when the meeting of the State Board of Agriculture is to take place?

The SECRETARY: My impression of the matter is that the law says that the election of officers shall take place on the fourth Wednesday of January, at the annual meeting of the Board in the city of Harrisburg. I do not think that there is anything in the act of Assembly that prohibits our going into session on Tuesday only so that we are in session on Wednesday when the election must take place.

A Member: Mr. Chairman, has the State Board any by-laws?

The SECRETARY: I believe that the State Board does not have any written by-laws. Secretary Edge, I think, at the last annual meeting made the statement that there are no written by-laws.

MR. HERR: Mr. Chairman, I think we have certain by-laws to regulate our admission and so on; but I think the Secretary is mistaken in his stating that the law creating the Board of Agriculture simply says that we must hold our election on Wednesday; I think it says that the Board shall convene on the fourth Wednesday in January at which time the annual election shall be held. We could hold the election on Thursday if we wanted to, but that is the date fixed for our meeting. I do not know that there is anything in the law to prohibit us from having a special day; but I know this, that inasmuch as the State Board of Agriculture is the recognized body of the State to hold these meetings, and the other Associations are not State associations, we should not divide up all our time and give too much of it to other organizations. We have now at our disposition a fund to pay for our annual meeting and to secure lecturers, and we are willing that that fund shall go to a certain extent where our friends want it to go in the line of stock breeding, dairying, and so on, that are so closely connected with the line of agriculture, and that is as appropriate to our work as it is to theirs, but I am opposed to cutting up any part of the time that should properly belong to our meeting. I won't oppose the motion to meet on Tuesday, but I shall oppose the motion to adjourn before the evening session on Wednesday. Sometimes some of us have to miss some of those sessions; it has been customary for the trustees of the college to meet on Tuesday evening preceding the meeting of the Board of Agriculture because a good many of the trustees are members of the Board of Agriculture and are interested in the meetings of the Board of Agriculture. The suggestion was that we adjourn Wednesday afternoon and give them Wednesday evening and Thursday. I do not see why their meeting cannot convene on Thursday morning instead of taking part of the one day that the law requires the Board of Agriculture to meet.

MR. BLACK: Mr. Chairman, I think that the Pennsylvania Live Stock Breeders' Association would be entirely satisfied to come in on Thursday. I do not think it is their wish to limit the meetings of the State Board of Agriculture at all.

The SECRETARY: Mr. Chairman, I would state that they made that request as stated by Brother Herr. It is very interesting to the live stock breeders to attend the meetings of the State Board of Agriculture, and possibly it might be of interest to some members of the State Board to attend the meetings of the Live Stock Breeders' Association. The Secretary will be satisfied with either arrangement; I can't see that there is any material difference whether we listen to an address or to several addresses delivered under the auspices of the Live Stock Breeders' Association or whether under the auspices of the State Board of Agriculture. We are all interested in the same line, and that is why we are good friends. The Breeders' Association look at it in this way. They will have their lecturers there, and we will have ours, and both organizations can have the same men in some instances, but it is a matter of entire indifference to me as to whether we shall allow them to begin their meetings on Wednesday or not. If we begin on Tuesday, we shall have all day Tuesday and Tuesday night and also two sessions on Wednesday; we will be able to have four or five sessions; then they would like to come in on Wednesday evening and continue through Thursday and that would give the Dairy Union people an opportunity to get in with their work, so that those who are there as members of the State Board would have an opportunity to attend their lectures right along the same line. I do not know that we have had a better presentation of live stock breeding than we had at our last meeting.

I feel just a little bit like Brother Herr——the State Board is a State institution and we can do as we please about this matter. Perhaps we will be conceding a little too much to give them the Wednesday evening meeting, but we must remember that the different sessions are made up, as it were, for the benefit of the same family, or for the same object.

MR. HERR: Mr. Chairman, the holding of a meeting on Wednesday evening would be a benefit to the Breeders' Association because they have no funds except their annual dues, while we have a fund which is to be devoted to our work; we cannot appropriate that to the Breeders' Association or any other, although while it would really lessen their burden to have a meeting on Wednesday evening, I do not know that it would increase our own. It is a little difficult to get there for a Tuesday morning's session. Such an arrangement would leave two days, Friday and Saturday, to go home on, and only one day to come on, and it seems to me they can just as easily extend the time.

MR. ORR: Mr. Chairman, I am not a member of this Board, and it has never been my privilege to attend a winter meeting of the State Board of Agriculture, but I would like to say here to the State Board of Agriculture that I think that instead of feeling that these other organizations in the State of Pennsylvania are infringing in any way upon their rights, privileges or prerogatives, it seems to

me that this State Board of Agriculture should be disposed to co-operate with the Breeders' Association, the Dairy Union or other organizations of that kind who want to meet with them in the same week and take part in their work, and share a part of the privileges that they may have at that time. It seems to me very desirable that all these organizations should meet in the same week. I know that in the State of Ohio the Sheep Breeders' Association and different other organizations—Shorthorn cattle, Jersey cattle, swine breeders and other associations meet the same week. In Indiana the same thing has existed for several years. I have been in Indiana at the time of the holding of their winter meetings, and instead of there being one thousand, 1,260 were present, and took part, not only in the Corn Growers' and Stock Breeders' Association, but other organizations that met at the same time, and I do hope that this may continue, and that a committee may be appointed which shall be empowered to arrange with these other associations to cover the whole time, having a popular meeting at night, say the first popular meeting on Tuesday evening under the auspices of the Breeders' Association, if you please, and another one on Wednesday evening under the State Board, and another one on Thursday evening under the auspices of the State Dairy Union.

I think that the State Board of Agriculture ought to feel itself complimented and that they should do everything in their power to bring these organizations together at that time so as to have one good, big full week devoted to the interests of agriculture and to the stock breeders and dairymen of the State of Pennsylvania.

MR. CLARK: Mr. Chairman, I made a motion which has not been acted upon.

The reading of the motion was called for.

The SECRETARY: Mr. Chairman, as I have noted it, the motion was as follows: It was moved by Mr. Clark that the Secretary would be authorized to arrange the meeting of the State Board of Agriculture so as to begin on Tuesday.

MR. STOUT: Mr. Chairman, couldn't you arrange to have this order of business without doing that? Don't that disarrange the whole proceedings of the Board according to the requirements of the law?

The SECRETARY: Mr. Chairman, the election of officers must be the particular order of the day on Wednesday under the act of Assembly.

MR. SEXTON: Mr. Chairman, I agree with Mr. Orr who suggested that the Board of Agriculture ought to feel complimented by the request of the other organizations to participate with us at the annual meeting. We certainly do, but we want them to do much better in that line in the future than they have done in the past, when perhaps they came in the afternoon or in the evening to meet us. I think it would be well to hold on to our old custom of having the full State Board meeting on Wednesday and Tuesday as well if we decide to open the meeting Tuesday morning; that is all right, but we want both Tuesday and Wednesday and it seems to me that

the Secretary can arrange for speakers on Wednesday evening. If we want the Association to help us we can have some of the prominent breeders give us an address on that night. It seems to me that that would be all right.

Mr. Herr asked for the reading of the motion made by Mr. Clark again.

The Secretary read as follows: "Moved and seconded that the Secretary be authorized to arrange the meeting of the State Board of Agriculture so as to begin on Tuesday."

MR. HERR: Mr. Chairman, I move to amend Mr. Clark's motion by saying, " to adjourn not earlier than Wednesday night."

The SECRETARY: Mr. Chairman, the Secretary would never take the authority to make any other arrangement.

MR. HERR: Mr. Chairman, the Breeders' Association have asked for Wednesday evening and I think that the Board ought to have it.

MR. CLARK: Mr. Chairman, that is all right, the Secretary will do what is right; we are satisfied he will.

The question being on the amendment, it was agreed to.

The question recurring on the original motion as amended, it was agreed to.

The CHAIR: Is there any more New Business?

MR. KAHLER: Mr. Chairman, I ask leave to offer a resolution.

There being no objection, the resolution was read by Mr. Kahler as follows:

Whereas, Agriculture is regarded as a paramount interest of our State, and contributes more to the general welfare of the State than any other industry, and

Whereas, This Board for years in the past have labored for the uplifting of agriculture and education, and as we are aware that it is absolutely necessary that we have legislative aid to accomplish work, and there is no means of accomplishing it except through the agency of the ballot box, and

Whereas, This Board is absolutely a non-partisan association,

Therefore be it Resolved, That this Board of Agriculture of Pennsylvania pledge its individual support, and as there has been in the past and is in the present an atmosphere of reform, that we pledge our best efforts and will use all honorable means along non-partisan lines to see that the very best men are nominated and elected in the coming campaign, men that are identified with our interests and who will give us a fair deal.

Mr. KAHLER: Mr. Chairman, I would say in support of the resolution, that I think it is an opportune time before our officers are selected, that we look, as all other industries do, a little to our own interests on non-partisan lines, and I think that we should devote a little more attention to our own interests. I, therefore, move the adoption of the preamble and resolutions.

MR. HALL: Mr. Chairman, I second the motion.

The question being on the motion it was agreed to.

MR. HALL: Mr. Chairman, there is a matter in the way of an unofficial statement in regard to the fact that there is to be new appointments at State College that will amount nearly to re-organization. It is almost absolutely certain that the Board of Trustees will be obliged to agree upon some one to take Dr. Atherton's place. It is also stated that Dr. Armsby is to be given the charge of the Bureau of Animal Nutrition and there will be a new man appointed as Dean of the School of Agriculture and in charge of the Experiment Station.

Now all the members of the Board know that the Act that created and provided for the land grants for colleges, of which Pennsylvania State College is one, specified that it did so, that they might give instruction in agriculture and the mechanic arts. Those of us who have visited the State College and given any thought to the matter, must have been struck with the disproportion of development between the primary and the secondary mission of the college. The secondary mission—the instruction in the mechanic arts——has been brought to a very satisfactory state, but the primary mission—the instruction in agriculture—seems not to have reached so satisfactory a state. Now it appears to me that one of the things that this Board ought to do, is to express its opinion as to who should succeed Dr. Armsby and Dr. Atherton in these positions. Now it would seem to me that it would be a good thing for the Board to urge upon the Board of Trustees that those positions be filled by men who are graduates of some agricultural industrial college, and when I say that, mean graduates of some college that has developed along the lines that the Act evidently intended they should develop.

Now all of us would deplore very much any reorganization of that college that would lower the standard of the department of Mechanic Arts, but all of us would hail with joy any reorganization there which would bring agriculture up on a level or even put it in advance of the department of Mechanic Arts, and it seems to me that we ought to recommend men for these two positions whose education and training and subsequent achievements are such as to ensure their being in sympathy with agriculture, so that those of us who visit the college may not find, as we do now, that the college spirit is not in favor of agriculture. If we had men in the two positions named it seems to me that that proportion and that spirit might be changed so that the college would be known just as widely and just as favorably for the strength of its department of agriculture, as it is now for its department of Mechanic Arts.

I do not know that it would be right to commit the Board to it but it seems to me that a resolution asking the trustees to fill those two positions with graduates from some agricultural, industrial college would now be timely.

The CHAIR: Are there any more remarks upon the resolution?

MR. BEARDSLEE: Mr. Chairman, I do not think there is any risk to run at all in this matter, and that the proper thing to do is

just to leave it in the hands of the Board of Trustees. I think they are qualified to do the right thing.

MR. BROSIUS: Mr. Chairman, it seems to me that we would be very unfit to recommend anyone for those positions. To-day the college does stand as one of the leading colleges of the State, while many men who work along agricultural lines think it has been diverted from its original intent, to make an agricultural college. Anyone that has read the law—the Morrill law—will find that it was intended to help develop Pennsylvania in all her great industries; and while it is perhaps true that it can do better than it has done in the past, yet many of us who live a hundred miles or more from the college are hardly fitted to judge of its needs, therefore, I agree with our friend here that the wise way is to allow the Trustees to take care of the college.

MR. HERR: Mr. Chairman, the subject is one of very great interest to me, and ought to be to every member of the State Board of Agriculture, and I feel that I am justified in saying, on behalf of the Board of Trustees, that I believe it is their purpose to strengthen the agricultural department of that college all they know how. I believe they are working with a common purpose to that end.

The Pennsylvania State College is our college and we are interested in it. It is a great institution and it has a very high standing with a strong corps of professors in the faculty, which it must necessarily have, and it must maintain an efficient corps of instructors throughout.

I want to tell you most emphatically that you can't appreciate and do not know the amount of expense incurred to keep up its present efficiency.

We are burdened with debt and I want to say this to you, that the appropriations that come from the Legislature, the great bulk of them, are specific. They can only go for the special purpose for which they are appropriated. We can't apply them to making the college more efficient, and building it up, increasing the strength of the faculty, and increasing the facilities for education there. With the increased number of students who come there every year, they need much greater facilities. While they have some eight hundred students, they are only properly equipped for about two hundred or two hundred and fifty, and without additional appropriations for general purposes instead of specific ones, as has usually been the case, it is impossible with the debt now existing to make the college what it should be, and it is up to you farmers to see to it that the men whom you elect to the Legislature be made to understand the situation and give us more money for general purposes.

All over the State I hear it said: "Why, Carnegie gave you $150,000; Schwab gave you another $150,000 and yet you say you want more money." They forget that this all entails additional expense to the college to take care of these new buildings that have been erected and to properly equip them. I want you to instruct your members of the Legislature that we must have more money for maintenance and for equipment; that is where we are lame. We are doing the very best we can, and accounting for every dollar of the money that is spent there, but we must have larger appropriations for the purposes I have stated. The Agricultural Depart-

ment of the Pennsylvania State College, if the farmers had taken hold of it long before as they have in the last couple of years, would have been way ahead of where it is now, but when we had an agricultural building worth two thousand dollars with an engineering building worth $250,000, it is easy to see where the students would drift to.

When we get the right faculty and equipment in the Agricultural Department, we will have more students in the agricultural course. That is the common purpose we want to work for, and we ought not to support members of the Assembly who will not stand by your agricultural interests in the instruction of our youth.

I am in earnest in this matter, and I have been on the Board of Trustees for a long time, and I have studied over it and grieved over it. It has worried me a great deal to find just how that college stood, but we have done the best we could with the amount of money that we had to support it. We need additional support and if you would go there and examine it, you would find out that we need some help, if we are to make the college what we want it to be.

That new building—McAllister Hall—we were simply obliged to go into the market and borrow the money to build that hall because we couldn't accommodate the students without it. I believe it is self-sustaining. It is an important thing, but the debt is there, which ought not to be there, and they are really obliged to make the debts. I want the Legislature—I want the sentiment of the people to go in there and say to the Legislature and to the Governor that they must help us out of this predicament and give us the appropriations that we need in order that we may have a college that we want.

MR. BEARDSLEE: Mr. Chairman, I am in favor of electing a Governor who won't veto what the Legislature does.

MR. HERR: Mr. Chairman, that is right.

The SECRETARY: Mr. Chairman, don't you want to be sure first what the Legislature will do?

MR. BEARDSLEE: Mr. Chairman, well, what they did do; they cut the appropriation right in two.

MR. BLACK: Speaking of the fact that the appropriations are specific, I recall that we wanted a few steers at one time out there and they had no money to devote to that purpose and they indicated that if certain persons would donate some steers, they would take care of them. Several members in Western Pennsylvania donated some steers to the college. Some two or three months afterwards, they sent for a sample of corn. These steers were donated and the freight was paid by the State and they were delivered at the college.

The CHAIR: Mr. Hall, did you want to offer a resolution?

MR. HALL: Mr. Chairman, if I offered a resolution now, it would be to the effect that the Legislature appropriate an adequate amount, with no strings to it, to give the college what it wants, and to pay its debts.

MR. BEARDSLEE: And let them buy their own steers.

MR. HALL: Yes.

The SECRETARY: Mr. Chairman, I move that we do now adjourn.

The motion being seconded, it was agreed to.

N. B. CRITCHFIELD,
*Secretary.*

# LIST OF COUNTY INSTITUTE MANAGERS FOR SEASON OF 1906-7.

Adams, ..... A. I. Weidner, Arendtsville.
Allegheny, ..... J. S. Burns, Imperial, R. F. D. No. 1.
Armstrong, ..... S. S. Blyholder, Neale.
Beaver, ..... A. L. McKibben, New Sheffield.
Bedford, ..... H. K. Lutz, Bedford.
Berks, ..... Howard G. McGowan, Geiger's Mills.
Blair, ..... H. L. Harvey, Juniata.
Bradford, ..... E. E. Chubbuck, Rome, R. F. D. No. 16
Bucks, ..... Watson T. Davis, Ivyland.
Butler, ..... W. H. H. Riddle, Butler.
Cambria, ..... H. J. Krumenacker, Carrolltown.
Cameron, ..... W. H. Howard, Emporium.
Carbon, ..... Brice Brinckman, Weatherly.
Centre, ..... John A. Woodward, Howard.
Chester, ..... Dr. M. E. Conard, Westgrove.
Clarion, ..... S. X. McClellan, Knox.
Clearfield, ..... E. M. Davis, Grampian.
Clinton, ..... Joel A. Herr, Millhall, R. F. D.
Columbia, ..... A. P. Young, Millville.
Crawford, ..... J. F. Seavy, Saegerstown.
Cumberland, ..... Rev. T. J. Ferguson, Mechanicsburg.
Dauphin, ..... S. F. Barber, Harrisburg.
Delaware. ..... R. M. Heyburn, Ward.
Elk, ..... John B. Werner, St. Marys.
Erie, ..... Archie Billings, Edinboro.
Fayette, ..... Sylvester Duff, Smock.
Forest, ..... C. A. Randall, Tionesta.
Franklin, ..... C. B. Hege, Marion.
Fulton, ..... R. M. Kendall, McConnellsburg.
Greene, ..... J. W. Stewart, Jefferson.
Huntingdon, ..... Geo. G. Hutchison, Warrior's Mark.
Indiana, ..... S. M. McHenry, Indiana.
Jefferson, ..... W. L. McCracken, Brookville.
Juniata, ..... Matthew Rodgers, Mexico.
Lackawana, ..... Horace Seamans, Factoryville.
Lancaster, ..... W. H. Brosius, Drumore.
Lawrence, ..... Samuel McCreary, Volant, R. F. D.
Lebanon, ..... Edwin Shuey, Lickdale.
Lehigh, ..... P. S. Fenstermaker, Allentown.
Luzerne, ..... J. E. Hildebrandt, Dallas R. F. D.
Lycoming, ..... A. J. Kahler, Hughesville.
McKean, ..... L. W. Howden, Coryville.
Mercer, ..... W. C. Black, Mercer.
Mifflin, ..... M. M. Naginey, Milroy.
Monroe, ..... Randall Bisbing, East Stroudsburg.
Montgomery, ..... Jason Sexton, North Wales.
Montour, ..... C. A. Wagner, Ottawa.
Northampton, ..... Wm. F. Beck, Easton, R. F. D.
Northumberland, ..... I. A. Eschbach, Milton, R. F. D. No. 1.
Perry, ..... A. T. Holman, Millersburg.

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| Philadelphia, | Edwin Lonsdale, Girard College, Phila. |
| | J. B. Kirkbride, Bustleton. |
| Pike, | B. F. Killam, Paupack. |
| Potter, | Horace H. Hall, Ellisburg. |
| Schuylkill, | W. H. Stout, Pinegrove. |
| Snyder, | Charles Miller, Salem. |
| Somerset, | Jacob S. Miller, Friedens. |
| Sullivan, | E. R. Warburton, Dushore, R. F. D. No. 3. |
| Susquehanna, | Dr. E. E. Tower, Hop Bottom. |
| Tioga, | F. E. Field, Wellsboro. |
| Union, | J. Newton Glover, Vicksburg. |
| Venango, | W. A. Crawford, Cooperstown. |
| Warren, | George A. Woodside, Sugargrove. |
| | R. J. Weld, Sugargrove. |
| Washington, | D. S. Taylor, Raccoon. |
| Wayne, | W. E. Perham, Niagara. |
| Westmoreland, | M. N. Clark, Claridge. |
| Wyoming, | D. A. Knuppenburg, Lake Carey. |
| York, | G. F. Barnes, Rossville. |

# LIST OF INSTITUTE LECTURERS FOR SEASON OF 1905-6.

Barber, Spencer F., Box 104, Harrisburg, Dauphin county.
Barclay, Richard D., Haverford, Montgomery county.
Bashore, Dr. Harvey B., West Fairview, Cumberland county.
Beardslee, R. L., Warrenham, Bradford county.
Black, W. C., Mercer, Mercer county.
Bond, M. S., Danville, Montour county.
Brodhead, C. W., Montrose, Susquehanna county.
Bruckart, J. W., Lititz, Lancaster county.
Burns, J. S., Imperial, R. F. D. No. 1, Allegheny county.
Butz, Prof. George C.,State College, Centre county
Campbell, J. T., Hartstown, Crawford county.
Clark, M. N., Claridge, Westmoreland county.
Conard, Dr. M. E., Westgrove, Chester county.
Cooke, Prof. Wells W., No. 1328 Twelfth street, N. W., Washington, D. C.
Cox, John W., New Wilmington, Lawrence county
Cure, Z. T., Jermyn, Lackawanna county.
Detrich, Rev. J. D., West Chester, Chester county, R. F. D. No. 12.
Drake, W. M. C., Volant, Lawrence county.
Funk, Dr. J. H., Boyertown, Berks county.
Hall, Horace H., Ellisburg, Potter county.
Harshberger, J. W., Ph. D., Philadelphia.
Herr, Joel A., Millhall, R. F. D., Clinton county.
Hill, W. F., Chambersburg, Franklin county.
Hoover, Hon. E. S., Lancaster, Lancaster county.
Hull, Geo. E., Transfer, R. F. D., Mercer county.
Kahler, Hon. A. J., Hughesville, Lycoming county.
Kester, R. P. Grampian, Clearfield county.
Ledy, J. H., Marion, Franklin county.
Lehman, Amos B., Fayetteville, Franklin county.
Lesh, N. M., Sciota, Monroe county.
Lighty, L. W., East Berlin, Adams county.
McDowell, Prof. M. S., State College, Centre county.
Menges, Prof. Franklin, York, York county.
Northup, Henry W., Glenburn, Lackawanna county.
Orr, T. E., Beaver, Beaver county.
Owens, Prof. Wm. G., Lewisburg, Union county.
Peachey, J. H., Belleville, Mifflin county.
Philips, Hon. Thomas J., Atglen, Chester county.
Sampson, Prof. H. O., Erie county.
Schock, O. D., Hamburg, Berks county.
Schwarz, Hon. R. F., Analomink, Monroe county.
Seeds, R. S., Birmingham, Huntingdon county.
Stout, W. H., Pinegrove, Schuylkill county.
Surface, Prof. H. A., Economic Zoologist, Harrisburg.
Thayer, Dr. I. A., New Castle, Lawrence county.
Wagner, F. J., Harrison City, Westmoreland county.
Wallace, Mrs. Mary A. ("Aunt Patience"), Ellwood City, Lawrence county.
Watts, Prof. R. L., Scalp Level, Cambria county.
Watts, D. H., Kerrmoor, Clearfield county.
Waychoff, G. B., Jefferson, Greene county.

# FARMERS' ANNUAL NORMAL INSTITUTE.

PROGRAM.

First session convenes Tuesday Afternoon, May 29, 1906.

J. W. NELSON, Shawville, Pa., Chairman.

Call to order 2.00.

Address of welcome, by Hon. Allison O. Smith, Clearfield, Pa., to which a response will be made by members of the convention.

1. "ANATOMY, PHYSIOLOGY, CARE AND TREATMENT OF FARM ANIMALS." (40 minutes, and 20 minutes for questions.)
   Dr. E. E. Tower, Hop Bottom, Pa.

2. "THE COMMERCIAL ORCHARD AS A BUSINESS." (30 minutes, and 20 minutes for questions.)
   Dr. J. H. Funk, Boyertown, Pa.

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Tuesday Evening, May 29, 1906.

HON. JASON SEXTON, North Wales, Pa., Chairman.

Call to order 7.30.

1. "GOOD SEED AND HOW TO OBTAIN IT; ADULTERATED SEED." (40 minutes, and 20 minutes for questions.)
   Prof. J. W. T. Duvel, U. S. Department of Agriculture, Washington, D. C.

2. "DOMESTIC SCIENCE OF FARM HOMES." (40 minutes, and 20 minutes for questions.)
   Mrs. T. E. Orr, Beaver, Pa.

3. "ACCUMULATION OF SOIL NITROGEN." (40 minutes, and 20 minutes for questions.)
   Prof. J. W. Harshberger, University of Pennsylvania, Philadelphia, Pa.

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Wednesday Morning, May 30, 1906.

J. S. BURNS, Imperial, Pa., Chairman.

Call to order 9.00.

1. "WHAT CHEMISTRY IS DOING FOR THE FARM." (40 minutes, and 20 minutes for questions.)
   Prof. Wm. G. Owens, Bucknell University, Lewisburg, Pa.

2. "SOIL IMPROVEMENT." (50 minutes, and 30 minutes for questions.)
   Prof. W. F. Massey, editor, The Practical Farmer, Philadelphia, Pa.

Wednesday Afternoon, May 30, 1906.

A. P. YOUNG, Millville, Pa., Chairman.

Call to order 1.30.

1. "ROUND-UP SESSION DEVOTED TO MATTERS RELATING TO LOCAL INSTITUTE MANAGEMENT, AND A GENERAL OUTLINE OF THE WORK FOR THE COMING SEASON." (40 minutes.)
Discussion opened by A. L. Martin, Director of Institutes.

Note.—This address to be followed by general conference, and five minute talks from County Chairmen and Institute Lecturers.

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Wednesday Evening, May 30, 1906.

T. E. ORR, Beaver, Pa., Chairman.

Call to order 7.30.

1. "MEMORIAL DAY." (30 minutes.)
Mrs. Mary A. Wallace, Ellwood City, Pa.

2. "THE BREEDING OF POULTRY FOR EGG PRODUCTION; HOUSING, CARE AND MANAGEMENT." (Illustrated by lantern slides.) (One hour, and 30 minutes for questions.)
Prof. James E. Rice, in Charge of Poultry Husbandry, Cornell University, Ithaca, N. Y.

3. "BEE KEEPING." (Illustrated by lantern slides.) (40 minutes, and 20 minutes for questions.)
Prof. H. A. Surface, Economic Zoologist, Harrisburg, Pa.

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Thursday Morning, May 31, 1906.

J. NEWTON GLOVER, Vicksburg, Pa., Chairman.

Call to order 9.00.

1. "ON WHAT DO THE DAIRY PROFITS DEPEND." (40 minutes, and 20 minutes for questions.)
Prof. H. E. Van Norman, Department of Dairy Husbandry, State College.

2. "FEED, BREED AND CARE OF THE DAIRY." (40 minutes, and 20 minutes for questions.)
Dr. J. D. Detrich, West Chester, Pa.

3. "THE ENFORCEMENT OF THE DAIRY AND FOOD LAWS." (40 minutes, and 20 minutes for questions.)
Dr. B. H. Warren, Dairy and Food Commissioner, Harrisburg, Pa.

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Thursday Afternoon, May 31, 1906.

I. A. ESCHBACH, Milton, Pa., Chairman.

Call to order 1.30.

1. "SOIL IMPROVEMENT WITHOUT STABLE MANURES." (40 minutes, and 20 minutes for questions.)
Prof. R. L. Watts, Scalp Level, Pa.

2. "ECONOMY IN BEEF PRODUCTION." (40 minutes, and 20 minutes for questions.)
Prof. T. I. Mairs, State College, Pa.

# PROCEEDINGS OF THE FARMERS' ANNUAL NORMAL INSTITUTE, HELD IN THE COURT HOUSE AT CLEARFIELD, PA., MAY 29, 30 AND 31, 1906.

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Court House, Clearfield, Pa.,
Tuesday, 2.00 P. M., May 29, 1906.

The meeting was called to order at the designated hour by Deputy Secretary Martin, who announced J. W. Nelson, of Shawville, Pa., as Chairman, and also made the following remarks:

DEPUTY SERETARY MARTIN: Before entering upon the work proper, it would be well to state that we have question blanks here for distribution, and we request that all members and visitors make use of these blanks, write the questions which you desire to ask and at the close of every lesson, the questions can be taken up and answered. We have with us, as you will have observed, a stenographer, it being our intention to take down the entire proceedings of the meeting. Please be as concise and direct as possible in order that the stenographer may prepare a manuscript that will be entirely satisfactory.

We would appoint as a committee to distribute and take up the question blanks, Mr. George F. Barnes, of York, and Mr. Chubbuck, of Bradford counties, who will have charge of that part of the work.

I know of nothing additional to say, my friends, further than express the pleasure it affords me to look into the faces of such a goodly number of the old workers—farmers institute workers of the State. We should say, however, that even here in Clearfield county, a county which takes a great interest in this work, we invite the citizens of the town and the county to join with us. They are heartily welcome to this meeting, and we shall be glad to have them engage with us in the discussion of the topics that are on the program.

We would also be pleased if the delegates not only would enroll their names on the registry list, but all others present. This can be done at any time when it will not disturb the meeting.

Now without further remarks, the meeting is placed in the hands of your chairman, Mr. Nelson.

MR. NELSON, Chairman: Mr. Secretary and Members of the State Board of Agriculture, and Institute Lecturers for Pennsylvania: It surely gives me a great deal of pleasure to welcome you people here to our town of Clearfield.

For the five years or more that I have had charge of the Institute work of Clearfield county, my associations with the members of the State Board of Agriculture, have been of the most pleasant and agreeable kind, and I assure you that I have enjoyed your meetings and have received a great deal of information during those years, and when I decided last winter to retire for a while in favor of a friend of mine who, during the next three years will take my place in the State Board, and I am glad that I have been successful in achieving this result, and I am glad that I have the pleasure of

speaking to you in my own native town to-day; glad that my last official connection with the State Board of Agriculture is in the town of Clearfield. I hope you will enjoy your stay here, and that you will find it both pleasant and profitable.

The county of Clearfield has taken a front rank in the institute work, and during the last year we held twenty-four days of continous institute work in the county. I don't know what we will be able to do in the future, for the good Book says, "Let not him that putteth on his harness, boast like him that taketh it off." I want to apologize for the slimness of the attendance at this afternoon's session, which is due to the fact that there is a convention in session at the other side of the river, and the room is full over there, and that has necessarily kept a great many of our farmers away this afternoon.

I now have great pleasure in introducing to you the orator of the day, Judge Allison O. Smith, who will deliver the address of welcome to the visiting members of the Department of Agriculture and members of this organization.

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## ADDRESS OF WELCOME.

By JUDGE ALLISON O. SMITH, *Clearfield, Pa.*

Mr. Chairman: To me your officers have assigned the pleasure of welcoming your body to our midst, and I sincerely hope you will not measure the scope of your welcome by the shortcomings of the address.

Clearfield county, as you all doubtless know, is not primarily an agricultural county, lumbering having been the chief business of past years. Mining and manufacturing, particularly of clay products, and railroading, furnish employment to the great majority of our people to-day. Scientific and intelligent agriculture is, therefore, in a measure in its infancy. Certainly then the educational influence of this institute with its varied program of instruction by learned professors, deserves from everybody in Clearfield, a hearty welcome.

It don't hurt to tell the truth, even about ourselves upon proper occasions, so that I want to say now to you who are strangers in the county, that the truth is that farming is not at the very highest stage of development in this county. This condition, I may say further, is not a criticism upon nor the fault of the very active and intelligent body of farmers of the county whom you will meet and whom it is my pleasure to greet at this institute. They are all right and are securing good results, but my complaint is that there are not enough of them. Our shortcomings, as an agricultural county, came about from natural conditions not hard to fathom.

Not to mention some possible disadvantages of soil and climate, the farmer of this county in the past only made farming an incident and not the real business of his life. So long as there remained a raft of timber on his farm, or in his neighborhood to cut and de-

liver, he preferred to make his money out of it and farmed simply as a secondary matter, only enough to feed himself and his stock, generally even falling short on that. The best powers either of mind or body were not given to the farm. With the passing away of the timber, his occupation was gone, and it too often became a serious problem for the old farmer to know how to make it go. We may truthfully say, therefore, that the Clearfield county farmer of past generations lived and died in the firm belief that farming here was a failure, and did not pay, and he was right from his point of view. So too, the boys, as a rule, left the old farm in the same belief, and became the professional man, the merchant, the mechanic and the miner of this generation, perhaps not to their advantage, either. The result is too apparent to anyone traveling through the country and shows itself up in hundreds of abandoned farms and vacant farm buildings with cleared fields surrounding them now grown up with briars and weeds.

Now it is perfectly apparent to any one who gives this subject thought, that the future welfare of the county, demands that more and more intelligent farming shall be done, or a source of great wealth be lost. Large areas of cleared land now idle with the soil being washed off annually by rains, should be redeemed, cultivated and made to produce something, if not an annual crop, then let it by all means be re-forested intelligently. It is of course too true, that in many parts of the county, at least, we have positive disadvantages of both soil and climate, and there was probably more truth than poetry in the complaint of the old lumberman farmer that it did not pay to farm as he did it. I take it too, that there may still be serious drawbacks in making it pay if followed on the old lines, and where mere grain growing is attempted; but what is the matter with dairying, raising poultry, truck farming and fruit raising? Are they not profitable? The handicap of soil and climate is amply recompensed by the higher price obtained for such products; quality too, is all right. For instance we get strawberries in our market from Florida in the early spring, and so on up along the coast, until the home berry is marketed in the summer. Now the plain fact is, that the best flavored and best strawberries generally speaking, are our own berries, grown in the Grampian Hills. So too, the best peaches marketed in Clearfield, are home grown, and I hope soon to see the day when we will not need to go to New York state for our best apples.

Now all this leads to one thought and one conclusion, and that is, that there is successful and profitable farming to be done in this county in spite of tradition to the contrary. Our only trouble is, as I view it, that not enough of our people have been giving the subject intelligent and thoughtful attention. With our vast population engaged in other trades, we of course cannot hope to be self-supporting and self-sustaining in all food products for man and beast, but a proper study into the nature of our soil and the uncertainties of our climate should demonstrate what to attempt to raise and what to leave alone, and will surely bring success along some lines.

May we not hope that the next generation will see our hills and valleys covered with fruit orchards and truck farms, financially successful beyond our dreams. If that day ever comes, however,

it will be due to the diffusion of scientific knowledge on farm topics which is taught through farm institute work such as we are now doing. The farmer of to-day must be intelligent, a thinker, as well as a worker. Time and money spent in institute work is well spent, and your work of education among us should be productive of the greatest benefit to all. We are indeed highly honored by having the leading thinkers of the State on farm and kindred topics among us on this occasion, and we fully believe that the helpful and stimulating influence of this meeting will be felt for years to come.

In the name and on behalf of all our people, I bid you a hearty welcome, and bespeak for your session both pleasure and profit.

The CHAIR: I now call on the Secretary of Agriculture, the Hon. N. B. Critchfield, to reply to the address of welcome.

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## RESPONSE TO ADDRESS OF WELCOME.

By HON. N. B. CRITCHFIELD, *Secretary of Agriculture.*

Mr. Chairman, Judge Smith, and Citizens of Clearfield County: Everybody likes to feel that he is welcome wherever he goes, and it is certainly very agreeable to us to have the assurance that we have just received that we are welcome to this beautiful little city. My greatest regret is, sir, that the Governor of our Commonwealth, who is President of the State Board of Agriculture, is not here to reply to the very eloquent address to which we have just had the pleasure of listening. We have heard of the resources of your county, and we rejoice with you in their possession, for what belongs to Clearfield county, belongs to Pennsylvania; and so we rejoice with you in the possession of your forests and your mines and your agriculture, which we are sorry to hear you say is not in a flourishing condition. We not only rejoice in our possession with you of the wealth of which you can boast, but we feel proud to be recognized as fellow-citizens of the good people of Clearfield county. We farmers have come to understand that if we are going to do our best with our herds and our flocks, it is important that we shall not breed too closely along the same family line; we want to bring new blood into our herds if we are to do our best, and I take it that what is true with regard to the lower animals, is true also in relation to the human race. I believe that the best people are those who are descended from many races, and if I am not mistaken with regard to your history, there courses through the veins of the people of Clearfield county the blood of the very best nations of the old world. When we go into some communities, we find the people descended from a single race; for example, in some communities we find that the ancestry is entirely German; in others, Scotch, in others English, in others Welsh, and in others Irish, but if I am correctly informed by a gentleman with whom I have had some conversation this morning, your early settlers in this county, came from Germany and from Scotland and from Ireland, and England,

and you even have here the English modifications that are found in the old Quaker stock of Eastern Pennsylvania, which we all know is not bad stock, therefore you ought to be good people, bred as you are, and it is not to be wondered at that you have the hearty, energetic, intelligent citizenship that we know resides in Clearfield county. We are glad as we come here, to recognize this, and we feel proud to be your guests, and glad to be here, to receive this royal welcome.

But now, Mr. Chairman, if you will excuse me, I must tell you something about ourselves. I remember years ago to have read a very amusing little anecdote of a pious Irish girl, who, on a certain occasion, went to confession, and while she was telling the priest of her short-comings and her failures in life, she looked up into his his face and said: "Father, I must tell you that I am engaged to be married to Patrick Dolan, and Pat was to see me the other night, and stayed until after twelve o'clock, and he kissed me." The priest being in a rather jovial humor said, "Now Mary, didn't Pat kiss you more than once?" And quick as a flash came the reply. "Now Holy Father, I came here to confess, and not to boast." And so like the Irish girl, I did not come here to boast, but I want to say to you, sir, that the brawny hands that we reach out to-day to receive the royal welcome extended to us, are the hands that feed the world.

Standing here in the temple of justice, I can but admire your work as it relates to all the liberal professions of life. I was walking over your town this morning and I admired the beautiful workmanship of your artists and artisans, and I heard some gentleman tell of the great fortunes have been amassed by some of the people here who have cut down your forests and taken your lumber to market, and we admire the business skill and acumen that have enabled men in the past in your midst to accumulate these great fortunes. But sir, what would become of the race, if for but a single year, the farmers of the country were to neglect to improve the seedtime and harvest which a kind Heavenly Father has promised to give through them to the children of men. Our calling is not only the oldest under the sun, but it is the one calling without which the world cannot survive.

You have referred to the fact that the farmer needs to be educated, and we have in recent years come to understand this matter as we never did before. We have come sir, to look upon our business as a profession, and we have come to realize that there is no industry that stands so closely associated with the great forces of nature as does the industry of agriculture. We realize the need of education, and so a beneficient government has in response to our call established our agricultural colleges all over our land. We have them in almost every state in the Union, but sir, we cannot all attend college. Some of us are too old, and those of us who are young, are under the necessity of battling with the realities of life in order to make a livelihood, and so we cannot all go to college, hence we have our institutes, a means by which the college comes to us and reaches out a helping hand, and here is where our State Department of Agriculture takes up the work, and broadens and extends the work that has been begun by our general Government. Our general assembly makes an appropriation by means of

which we are enabled to employ men, graduated from our agricultural colleges, and others graduated from the equally important school of experience, who travel all over this broad Commonwealth, to impart instruction to those who wish to learn. The work begins in the fall of the year, just as soon as we have gathered in our crops. When we have our potatoes and our apples and our cider stored away in the cellar, and our fuel is all gathered in, then our institute work begins, and these lecturers travel over the State giving instruction in methods of cultivation, soil improvement, dairying, stock breeding and farm and household economy, which proves beneficial to us all, and this, sir, is the character of the people that you have here to-day. The men who are engaged in this work need to be well equipped, for the farmer is not only a student, but he is an apt student, who not only learns readily but who has the ability to discern between the teaching that is true and that which is false.

I remember that when a few years ago this work was begun in the State of Pennsylvania, there were doubting Thomases in the audience, and not until there had been some progress, until they saw the effect it was having upon our agriculture, did some of these men regard the work favorably, but they are becoming apt pupils now.

These instructors that we send out must be able to keep up with the advances made by their pupils, and sometimes this is no easy task.

I remember when I was a boy of sixteen, I taught a public school to which there came a class of boys and girls older than myself who had been away to an Academy, where they had been studying English Analysis, and had gone through the first book of Davies Algebra, and I tell you, I had a tough time of it to keep out of their way. I think possibly such has been the case in regard to our institute work, but thanks to the energy and earnest devotion of these lecturers, they have kept in advance. They seem to have seen in the very beginning of the work, that it would be necessary for them to keep in advance of their pupils, and that to do this they must labor industriously and they did it, and did it well, and it is due to their energy and fidelity and to the good judgment of our Director of Institutes, Brother Martin, that we have kept up the standard, and we have been able to meet the call for higher training and more advanced work as that call has come.

This, Mr. Chairman, is the character of the people whom you entertain to-day. I am glad to have received this welcome from Judge Smith, and I am glad to be here. I am glad to have the honor of being entertained by the good people of Clearfield and Clearfield county, and when the work of this week has been done, when we have accompished the objects that have brought us together, and when we go out, as I trust we shall, strengthened for the work in which we are engaged, to our various homes and various fields of labor, I feel sure we shall go cherishing the kindest feelings towards the people of this little city, and (addressing Judge Smith) I hope that you, sir, and the citizens of Clearfield will feel that some little good has come into your lives because of your association with us.

The CHAIR: We have with us this afternoon one of the largest market gardeners in Pennsylvania, one of the men who uses the

most fertilizers of any person in the State, and one of our good old grangers, Brother M. S. Vaughn. We shall be glad to hear from him.

MR. VAUGHN: Mr. Chairman, Ladies and Gentlemen of the City and County of Clearfield: In behalf of the officers and members of this organization, I wish to thank you for this cordial welcome, this fraternal greeting that has just been extended to us by an honorable representative of your city and county; and let me say, my friends, that it affords me great gratification to be able to tell you that he is a product of the soil of my native county. He is one of my boys. We grew up together, I was a little ahead of him; we toiled and labored in the fields side by side. We have eaten at the same table, partaken of the same nourishment, and we have hunted rattle-snakes and picked huckleberries side by side, and that was before the discovery of the antidote of the rattle-snake bite, and we were not provided with it.

I feel proud that I can stand here and realize the predictions that were made years ago, the predictions in regard to this honorable gentleman have been borne out and confirmed. I always predicted that for him, because from a boy to a man, you never found him engaged in anything, countenancing or recognizing anything that did not lead to the highest standard of manhood.

Now I am only here to emphasize a few of the remarks that have already been made. I wish to emphasize a few of the reflections that your worthy Secretary made in reference to this class of people. I want to say to you people of Clearfield that it will not be necessary for you to increase the number of your peace officers or enlarge your present accommodations in your county jail on our account. We can vouch for every man among us with one exception, and if the supply of vegetable matter and cow-horn turnips holds out, perhaps even he will not be an exception.

I want to thank you for this privilege of addressing you. I do not intend to consume much of your time, but I want again to extend to you the thanks of this convention, and all the members of this convention for this cordial greeting and this kind welcome, so ably given to us at this meeting.

(Cries for "Bob" Seeds.)

MR. SEEDS: Mr. Chairman, County Chairmen, Institute Workers, and Ladies and Gentlemen: I want to say to you that I am delighted to meet you people, and I want to take this occasion to thank the county chairmen for the nice way they have treated me in going over the State of Pennsylvania. I also want to thank the Institute workers for helping me to make the institutes a success. As long as I am interested in agriculture, I want to be with you. I am glad to meet you. Since I was a little bit of a boy at my grandfather's knee, I have heard of Clearfield county, and my first impression of Clearfield county was such that I believed that if a whippoorwill would come here, he would have found the conditions such that he couldn't stay over night. I sat at my grandfather's knee when I heard them talk about a farm that he owned in Clearfield county. I heard him tell his boy that he was going to sell it, because he said that the trees were so large it would cost more to take them off the land than the farm was worth; that farm was worth more than—

the coal beneath the surface was, worth more than his farm over in Huntingdon county.

I am delighted to come to your county. I had the pleasure of traveling through this county when I was working for the Deering Harvester Company, and the largest sale I ever made in any one week I made in your county, and I found more summer schools in Clearfield than in any other county I ever visited.

When you talk about Farmers' Institutes, I will tell you that the rest of the counties want to get a skate on, if they want to keep up with Clearfield county.

I want to thank you for the privilege of being with you. I know that Brother Vaughn has talked about my cow-horn turnips; I guess I am known all over the State, if not all over the country as the biggest story teller in the world, but I would sooner be even a good liar than a poor farmer.

The Secretary struck the keynote when he talked about the Institute lecturer keeping out of the road of his pupils. The whole thing hinges on education. I once heard a definition of education that struck me very forcibly: "An education is that which puts a man onto his job." It is just that. It is just so with the architect, just so with the lawyer, and just so with the farmer. I remember a story of a certain man who fell down and struck his nose in such a way on a sharp instrument that it was cut completely off. He picked up his nose and stuck it on again and tied it on with a bandage, and after a while, when he thought the nose had properly healed, he took off the bandage and looked in a looking-glass, and lo and behold, he had put his nose on upside down, and every time it rained, the rain ran down his throat, and every time the poor fellow sneezed, it blew his hat off. He wasn't educated; he didn't observe, or he would never have put his nose on wrong side up. I tell you the whole thing hinges on education, yet often the man who has given us a new idea has been called a crank.

When Fulton built the first steamboat, he had a rich uncle who had money to burn, and the uncle told him it wouldn't do, but Robert Fulton worked on through his rich uncle declined to help him out with a cent. He never ceased his efforts and after his little steamboat was completed and he pushed it out into the Hudson River and rang the bell to go ahead, there was trouble in that little boat and it wouldn't move and his rich old uncle stood on the river bank and said, "Bob, I told you it wouldn't go; it won't go, it will never go." But Robert was not discouraged. He took his wrenches and his tools and he did this and he did that; he adjusted a bolt here and a screw there, did a few things that he thought necessary and then he pulled the throttle open and his little steamboat moved on, and his old uncle stood on the bank and shouted after him, "You'll never get it stopped, you'll never get it stopped!" That is the way it has been ever since the foundation of the world. "It is the man who does the best who gets more kicks than all the rest."

From the register it was found that the following Institute Managers were present:

| County. | Name and Place. |
|---|---|
| Adams, | A. I. Weidner, Arendtsville. |
| Allegheny, | J. S. Burns, Imperial, R. F. D. No. 1. |
| Armstrong, | S. S. Blyholder, Neale. |
| Beaver, | A. L. McKibben, New Sheffield. |
| Bedford, | H. K. Lutz, Bedford. |
| Blair, | H. L. Harvey, Juniata. |
| Bradford, | E. E. Chubbuck, Rome, R. F. D. No. 16. |
| Bucks, | Watson T. Davis, Ivyland. |
| Cambria, | H. J. Krumenacker, Carrolltown. |
| Carbon, | Brice Brinckman, Weatherly. |
| Centre, | John A. Woodward, Howard. |
| Chester, | Dr. M. E. Conard, Westgrove. |
| Clarion, | S. X. McClellan, Knox. |
| Clearfield, | E. M. Davis, Grampian. |
| Clinton, | Joel A. Herr, Millhall, R. F. D. |
| Columbia, | A. P. Young, Millville. |
| Crawford, | J. F. Seavy, Saegerstown. |
| Cumberland, | Rev. T. J. Ferguson, Mechanicsburg. |
| Dauphin, | S. F. Barber, Harrisburg. |
| Delaware, | R. M. Heyburn, Ward. |
| Elk, | John B. Werner, St. Marys. |
| Erie, | Archie Billings, Edinboro. |
| Franklin, | C. B. Hege, Marion. |
| Fulton, | R. M. Kendall, McConnellsburg. |
| Greene, | J. W. Stewart, Jefferson. |
| Huntingdon, | Geo. G. Hutchison, Warrior's Mark. |
| Indiana, | S. M. McHenry, Indiana. |
| Jefferson, | W. L. McCracken, Brookville. |
| Juniata, | Matthew Rodgers, Mexico. |
| Lackawanna, | Horace Seamans, Factoryville. |
| Lancaster, | W. H. Brosius, Drumore. |
| Lawrence, | Samuel McCreary, Volant, R. F. D. |
| Lebanon, | Edwin Shuey, Lickdale. |
| Lehigh, | P. S. Fenstermaker, Allentown. |
| Luzerne, | J. E. Hildebrandt, Dallas, R. F. D. |
| Lycoming, | A. J. Kahler, Hughesville. |
| Mercer, | W. C. Black, Mercer. |
| Mifflin, | M. M. Naginey, Milroy. |
| Montgomery, | Jason Sexton, North Wales. |
| Montour, | C. A. Wagner, Ottawa. |
| Northumberland, | I. A. Eschbach, Milton, R. F. D. No. 1. |
| Perry, | A. T. Holman, Millersburg. |
| Pike, | B. F. Killam, Paupack. |
| Potter, | Horace H. Hall, Ellisburg. |
| Schuylkill, | W. H. Stout, Pinegrove. |
| Snyder, | Charles Miller, Salem. |
| Somerset, | Jacob S. Miller, Friedens. |
| Sullivan, | E. R. Warburton, Dushore, R. F. D. No. 3. |
| Susquehanna, | Dr. E. E. Tower, Hop Bottom. |
| Union, | J. Newton Glover, Vicksburg. |
| Venango, | W. A. Crawford, Cooperstown. |
| Warren, | George A. Woodside, Sugargrove. |
| Westmoreland, | M. N. Clark, Claridge. |
| Wyoming, | D. A. Knuppenburg, Lake Carey. |
| York, | G. F. Barnes, Rossville. |

Of the Institute Lecturers, the following were present:

Barber, Spencer F., Box 104, Harrisburg, Dauphin county.
Bashore, Dr. Harvey B., West Fairview, Cumberland county.
Beardslee, R. L., Warrenham, Bradford county.
Black, W. C., Mercer, Mercer county.
Bond, M. S., Danville, Montour county.
Brodhead, C. W., Montrose, Susquehanna county.
Bruckart, J. W., Lititz, Lancaster county.
Burns, J. S., Imperial, R. F. D. No. 1, Allegheny county.
Butz, Prof. George C., State College, Centre county.
Campbell, J. T., Hartstown, Crawford county.
Clark, M. N., Claridge, Westmoreland county.
Conard, Dr. M. E., Westgrove, Chester county.
Cox, John W., New Wilmington, Lawrence county.
Cure, Z. T., Jermyn, Lackawanna county.

Detrich, Rev. J. D., West Chester, Chester county, R. F. D. No. 12.
Drake, W. M. C., Volant, Lawrence county.
Funk, Dr. J. H., Boyertown, Berks county.
Hall, Horace H., Ellisburg, Potter county.
Harshberger, J. W., Ph. D., Philadelphia.
Herr, Joel A., Millhall, R. F. D., Clinton county.
Hill, W. F., Chambersburg, Franklin county.
Hoover, Hon. E. S., Lancaster, Lancaster county.
Hull, Geo. E., Transfer, R. F. D., Mercer county.
Kahler, Hon. A. J., Hughesville, Lycoming county.
Kester, R. P., Grampian, Clearfield county.
Lehman, Amos B., Fayetteville, Franklin county.
Lighty, L. W., East Berlin, Adams county.
McDowell, Prof. M. S., State College, Centre county.
Menges, Prof. Franklin, York, York county.
Northup, Henry W., Glenburn, Lackawanna county.
Orr, T. E., Beaver, Beaver county.
Owens, Prof. Wm. G., Lewisburg, Union county.
Peachey, J. H., Belleville, Mifflin county.
Philips, Hon. Thomas J., Atglen, Chester county.
Seeds, R. S., Birmingham, Huntingdon county.
Stout, W. H., Pinegrove, Schuylkill county.
Surface, Prof. H. A., Economic Zoologist, Harrisburg.
Thayer, Dr. I. A., New Castle, Lawrence county.
Wagner, F. J., Harrison City, Westmoreland county.
Wallace, Mrs. Mary A.("Aunt Patience"), Ellwood City, Lawrence county.
Watts, Prof. R. L., Scalp Level, Cambria county.
Watts, D. H., Kerrmoor, Clearfield county.
Waychoff, G. B., Jefferson, Greene county.

The following visitors were present:

J. A. Farabaugh, .....Bradley Junction.
Miss Anna M. Burns, .....Imperial.
J. C. Mattern, .....Hollidaysburg.
E. L. Phillips, .....New Bethlehem.
J. M. McKee, ..... New Bethlehem.
M. P. Hallowell, .....Ivyland.
C. O. Mattern, .....Osceola Mills.
W. C. Patterson, .....McConnellsburg.
Mrs. G. B. Waychoff, .....Jefferson.
E. M. Davis, .....Grampian.
Mrs. W. L. McCracken, .....Brookville.
Mrs. Ella M. Lighty, .....East Berlin.
H. G. Supplee, .....Bloomsburg.
B. F. Kahler, .....Hughesville.
Alex. Stittmatter, .....Bradley Junction.

The CHAIR: We will now take up our regular program. The first number is entitled "Anatomy, Physiology, Care and Treatment of Farm Animals," by Dr. E. E. Tower, of Hop Bottom, Pa.

The address of Dr. Tower is as follows:

## ANATOMY, PHYSIOLOGY, CARE AND TREATMENT OF FARM ANIMALS.

By DR. E. E. TOWER, *Hop Bottom, Pa.*

The subject you will notice on the program is a pretty broad one, one that should take up several hours, if we attempted to go into the minute details of what this subject represents. To talk of the anatomy, physiology, care and treatment of farm animals, means a great deal, and at best we can only hint at what I wish you all to fill out for yourselves. The few things that I shall present to-day I hope will be magnified by our fellow-institute workers and that

they may in some cases be able to give the farmer some hint which may save the life of a valuable animal. There may be some little things which I may not think of, and which I would thank you all to ask me about when we come to that point.

(The Doctor had, before beginning his lecture, hung upon the wall two models or charts, one representing in detail a horse the other a cow.)

These two models which I have hung upon the wall you will recognize as models of the horse and the cow. Let us for a few moments consider them as two machines, created for the use of the agriculturist, machines without which agriculture could not exist. To some perhaps this may seem a little overdrawn, but I will go a step further and say, machines without which civilization could not exist.

We all know that with every kind of machinery, there are certain rules to be followed. While there are a great many different kinds of machines, all have a certain motive power, depending largely upon their construction and the purpose for which they are designed. One may have a lever here to move to the right, another may move to the left. One may require steam and another may require the explosion of gasoline or some other substance to set the wheel in motion, but all tend to the same end, namely, to produce power whereby the machine may do the work for which it is designed.

The man who is successful in manipulating this machine must know all the intricate parts. He must know what particular kind of fuel will produce the most power. He must know how much fuel to use and when to use it. He must know that all parts are properly adjusted and that the important bearings are properly lubricated. He must know the limit of speed at which his machine may run without danger of explosion or injury.

(Referring to the model of the cow.) In this picture we have the bones of the animal exposed and you will see here the large number of levers—we will call them levers, bones or levers that are designed to work this great machine which is here represented.

Here we have a representation of the circulation of the blood and the nervous system, showing you how all these veins and arteries are arranged. The blue lines represent the veins and the red lines the arterial circulation, as it is thrown away from the heart. In here you will notice the glands (pointing to the part indicated on model.) Here we have the sub-maxillary gland which is so often diseased with tuberculosis. Pardon me, but I cannot help bringing in that subject of tuberculosis once in a while, because it is something I am very much interested in, and all farmers should be. The gland as represented here is supposed to be in the natural condition, although perhaps a little overdrawn down here (indicating).

Here we have another division. In this we have removed the skin only. This part comes next to the skin and shows the nervous circulation. Here we have the spinal column, looking at it from the front and running all through. All these little white lines are nerves. People sometimes say that the cow has no nerves. Just look at that and see if you think there are no nerves in that cow. No man of any sensibility can look at that and then go home and

bang the cow over the head or hip with the milking-stool. If he does, he hasn't got good sense.

I want to speak of the muscles a little. You will notice the interlacing of these muscles. They act as supports and assist in the operation of all these levers that I spoke of, two hundred and fifty-six in number and they are all bound up here.

Now I want to go a little further on to the digestive tract, and here we have the lungs in their natural condition, and they are colored as near to nature as possible in their healthy condition. However, a great many changes will take place in different diseases.

I want to refer to the lungs. Here is a part that some people have an idea must be affected in order to have tuberculosis. An animal may die with tuberculosis, and the lungs scarcely be affected, simply because some other organ may be affected instead of the lungs. Pulmonary tuberculosis means an affection of the lungs, but there are cases where the lungs are not affected, and still tuberculosis be very apparent.

We cut up the lungs and see in there the bronchial tubes; all these little branches are the bronchial tubes through which the air passes, and is passed from the animals in the respirations from the lungs. Here we have the heart lying right between the lungs in this position. We will cut that heart open and notice its structure. Could you make one of those pieces of machinery? If you did, it would not work. That heart is the seat of the whole thing. Of course all of these have got to work in unison, or else they are no good. If this heart wears out, you can't throw it away and get a new one. You have got to keep it in repair, consequently more care is required to do it than with any machine that has ever been built.

Here you will observe the kidneys in position, showing as nearly as may be their natural color. We will cut this kidney open and see the inside structure of the kidneys. Here we have a representation of the first stomach; the cow is provided with four stomachs. This is called the first or paunch. The horse is provided with only one—I will show you that a little later. Here we have the spleen, and while I am speaking of the spleen, I want to speak of one disease which is a very deadly disease among stock, and one also very deadly to people—anthrax. You probably know what it is, one of the worst diseases that ever was known. In anthrax this spleen will be enlarged from three to four times its natural size. If you were to take this spleen off in the case of anthrax, and if you were to cut into this, it would present a jelly-like, black, tarry appearance. No other disease that we know of can produce that appearance. Then again in anthrax you will find little red spots perhaps on the paunch, perhaps on the intestines. Just underneath the skin, you will find little spots of blood. In blackleg, which occurs in young animals, you always have bloating, very extensive, in anthrax never. Now we will just lay this paunch as we call it open and see what is inside. (Exhibiting and describing inside of paunch.)

Here we have the small intestines. In the cow we have 150 feet of digestive tracts which is twice the length that is in the horse—seventy in the horse, a hundred and fifty in the cow. The horse has one stomach, the cow four, as I have said. Here we have the second, third and fourth stomachs. Here we have the true diges-

tive stomach, and these are laid in position just as they appear in the natural animal. A great many people get peculiar ideas as to where this stomach of the cow lies, and that is I think, a wonderfully nice thing to study, and it is a great help if fully understood, in knowing how to treat them. Here in this stomach (indicating) we have the true digestive part where the food is pressed and agitated, separated, getting out the parts that go to make up the blood and the muscle.

We will go on a little further. Here we have the liver in position with the gall bladder here (indicating). In regard to the digestive organs, here we have coming down through the esophagus or small pipe which you will notice runs between the lungs and in here we have the wind-pipe or the trachea. Now it would not be best if I could, to go on and give you a minute description of every one of these organs or every one of these little nerves and blood-vessels and all those things, but our time won't admit. Here we have the trachea which you see goes into these tubes right here as shown. The air goes through here and then it begins to sub-divide just like the little brooks that go to make up a great river.

One thing I wish to mention, that is, the choking of animals. Hardly a farmer who has not had more or less experience with animals being choked, and this can be remedied to a very great extent, or can be relieved. While animals will get choked once in a while, it can be helped, and I will tell you how the choking will take place, probably up in here (indicating on model), although it may be down here back of the lungs and very near the stomach. I will tell you the simplest thing in the world to do in a case of that kind, and it may save the life of a valuable animal and will not hurt your animal. Take a piece of common rubber hose, you need not use only about six feet of it, and insert that right down the cow's neck; perhaps it would be well to take a card and put this in the animal's mouth to hold her mouth open and run this rubber pipe right down here until you strike your apple or whatever it may be that chokes her. Often it will occur that the apple is so swelled in there, or so firmly wedged as to be difficult to stir. Now step back to your buggy and take your buggy whip and run it down this rubber pipe. The pipe as it strikes the apple will fit around that apple so that there will be no danger of making any hole, and then press the end of your whip carefully down until it reaches the stomach, and when it reaches the stomach, the gas will certainly escape through that pipe so quick that your animal will be entirely relieved in a very few minutes.

Only last fall I was called to see a cow that was choked. I noticed blood dribbling down the sides of her mouth, and I asked the owner of the cow what he had been doing and he wouldn't tell me. I did not blame him; I wouldn't either, if I had done it, but finally he said, "I took the rake's tail and put it down her throat and it went somewhere but she didn't seem to be any better." I said to him, "I can tell you where it went, it went through that esophagus, and into the muscles of the neck which will cause the death of your cow very soon," which it did. The cow died that night. To be sure that he had done the mischief, he cut the neck open and found a slit about six inches long where he had forced the rake

handle through. A drover came along in one case where a cow had picked up an apple—I want to say right here, if a cow gets in where the apples are, do not run them out nor set the dog after them to chase them away. If you go to running them, or chasing them with a dog, they are almost certain to become choked—this drover as I commenced to say, had a nice yearling that picked up an apple and choked on it. They had an old man along with them who, as it happened, had a very large cane, and it was very sharp on one end, and the old man took this cane and jammed it down the throat of the animal and it died in about an hour. The rubber hose is the best thing for relieving this condition, and any man can use it, and if you institute workers will convey this knowledge to the farmers as you travel over the State, it may be the means of saving a valuable animal, and if I can be the means of saving the life of one animal of that kind, I shall feel that I have been well paid.

There is another subject which I want to mention, and that is dehorning which is quite common at present. I am not going to say whether it is best or not. The farmer knows better than anybody else whether that animal should be dehorned or not. If the animal is ugly and unmanageable, I would certainly dehorn it. Now as you have probably noticed, there is bleeding after dehorning. You see the little arteries that come up in here (indicating on model) come up to the horn very closely to the edge of the gland that goes to the horn. Now the bleeding never comes from the inside of the horn, but it comes from this little facial artery that curves up very near and then goes back in here and in cutting it off, most of men cut a little of the skin—in cutting it off you often clip that little artery. I was called out to see one the other day. It had bled more than a pailful, and the man had a ball of cotton batting wound around the cow's head. Now when you get a case of that kind, keep cool; don't get excited; just go to that cow and see where that blood comes from. You will find just as I have told you, that it comes from the outside of the horn, right about there (indicating on model) you will find a little artery which will spurt right up. Now take your thumb nail and hold it for half a second or so there, and in nine cases out of ten it will stop it at once. Any little thing that will shut that together just for an instant is all that is necessary, and the bleeding is all stopped, but do not try to bundle on a great lot of cotton batting; that only soaks the blood up after it comes out.

In dehorning, never leave the hole open in the horn. Nearly all our cattle are subject to hollow-horn. You will find there is an immense opening at the stump of that horn after it is cut off, a very good idea, as was once suggested by our worthy Secretary, take a piece of cotton cloth about the size of that (indicating the size) spread a little tar on that and put it over the hole. That hole runs directly down to the head, and connects with the nasal passages, and if you will take pains to examine, you will find that the breath will spurt right out of that hole.

(The doctor now passed over to the model of the horse.)

Here we have the bones. You will notice that in the horse the bones are a little more compact than in the cow, for the horse is a beast of burden. In this we have 256; in that, 251, the main difference coming in this part of the animal. (Indicating.)

In here you will notice that the circulation as compared with that is perhaps a little stronger; the veins and arteries are a little bit larger, and the circulation in here is of course a little different on account of the difference in the organs. There is a little thing I wish to speak of right here. I wish to speak of bleeding or hemorrhage. It is quite often that the farmer meets with an accident either in plowing or harrowing or some other work, and an artery gets cut. I saw a case where a man struck his horse with a whip, and the whip struck this artery and cut it open, and the horse of course bled terribly. And in another case only a few days ago a horse run away and cut the artery right in here so that it bled terribly. In this case, the owner of the horse called me up on the 'phone. He said, "You can't get here before the horse will die, and he is a very valuable horse; can't you tell me something to do." I said, "Yes." I told that man to take a little stick about as big as a lead pencil or a little larger, about like that (indicating) and put his hand around the leg until he came to the point where the blood starts then take the stick and lay it over that point, and take a little cotton cloth bandage and wind around it, and he would stop that bleeding simply and easily, which was done.

I will tell you what they will do in most every case. They will take a big string or small rope and twist it up until they nearly cut the skin through, and in fact, I have seen cases where the skin has been cut entirely through by this cord, and the blood kept coming just the same. Now it is nature's privilege to put these arteries in a little groove, and you may tie a string around there tight enough to cut the skin clear through, and you won't stop the bleeding; but take a cork and put it over that spot and you will stop it. You see the idea is to get a little pressure onto this point.

A Member: Mr. Chairman, just there, if you please, I would like to inquire of the Doctor how we shall know the difference between the veins and the arteries.

DR. TOWER: I will say in reply, that you will notice here the blue lines represent the veins, or the venous blood; the red lines represent the blood, the purer blood which is going down this way (indicating). You can tell by the color of the blood which one you have got, whether it was from a vein or an artery. You would scarcely get very little bleeding coming up here, (indicating) however, I would recommend that you use a stick long enough or a cork, or whatever you have, to cover both ends, and then do not put on a bandage tight enough to give the horse any pain, and this you will find will work in almost any part of the body, and it is something that you all know, that requires prompt attention. If a man has a horse or a cow that has a sudden hemorrhage or bleeding, it requires prompt attention. At one place I saw a man faint away just from seeing the horse's leg which was cut. Of course there are men of that kind, that can't help it. I don't blame them. You will notice all the blood circulation that goes around the head. There are some little ones, too, that are not shown on this model, so you can see how liable they are to be injured.

The SECRETARY: Mr. Chairman, may I ask the Doctor through you, to kindly tell us how to take the pulse of a horse.

DR. TOWER: The pulse can be taken very easily. You have the pulsing of the vein and artery both. Any place where you can

press the artery upon the bone, you can feel the pulse, but this is the most convenient place, right up there against this jaw bone. I would recommend you to practice that in health as well as disease; learn what is a quick pulse, a hard pulse, or a slow pulse—learn the variations from the normal.

Now you will notice that in the muscular system the muscles are a little bit more marked, that they are a little more spread out than they are in the cow; that is to say, they are not blended together quite so closely. Now I want you to look for a minute at this limb. Then you will notice another one that goes from here and runs down through here and passes on front here. They are all put in there for a purpose. No machine that was ever built could have all these levers working in such perfect harmony as in an animal of this kind. Then you look down here to the binding ligaments, and you will find another that works always in unison. There is no side-pulling of any of those muscles in health. When you come to study these all over, it isn't anything strange that a horse gets lame; it is more wonderful that they are not lame all the time, the way they are used sometimes.

Now we will go on with the digestive organs. Here we have the lungs, which you will notice are not as large as they are in the cow in proportion. There is a disease known as heaves. Now what I would do in a case of heaves, or what the cure is for heaves, I am often asked? When you read an advertisement promising to cure heaves, or a man tells you that he has a medicine that will cure the disease, you want to be on your guard, because I am here to say to you that no man on earth can cure heaves except by putting in a new set of lungs, which I do not want to undertake. Now what causes heaves? You notice these little black lines running along in here; they represent the different air cells of which the lungs are made up. In heaves there has been a rupture of these air cells. Two or three have been made into one. That is what causes the noise you hear. It is a rupture of the air cells and nothing else.

A Member: Mr. Chairman, I would like to inquire of the Doctor what causes heaves.

DR. TOWER: Heaves are caused sometimes from feeding too much coarse, dry feed. It may be brought on when a horse has been, perhaps, lately fed, and then is started off on a fast run, so that the air is forced so violently through the lungs that the walls of the cells are not able to withstand the pressure and they burst through. Of course dry, dusty feed may cause the same effect.

You will notice in here that the bronchial tubes are a little heavier than those of the cow; then again you see that the shape of the heart is a little bit different. You will notice the position of the heart; it lies right behind the front shoulder. I had a man the other day say, "Just look at that horse's heart beat," when the horse had the thumps, and the beating was located back here (indicating). Now you know that thumps may be described as spasm of the diaphram, the heart has nothing whatever to do with what we call thumps. If you want to test that, put your ear to the heart and put your hand on the spot where the thumping is going on, and you will find that the heart beats with one motion and the

thumps with another, showing very conclusively that the heart has nothing to do with it.

Here we have the stomach of the horse (pointing to same on model) which you see is very much different from what it is in the cow. It may be described as a large storehouse which contains all the feed which is there manufactured into the various substances which the horse requires to support his life and strength as a beast of burden.

MR. FENSTERMAKER: Mr. Chairman, I would like to ask the Doctor what is the cause of thumps.

DR. TOWER: Well, if you will tell me what is the cause of hiccoughs in a man, I will tell you what is the cause of thumps in a horse. It may come from different sources. It may come from a tired condition, from a condition in which the nerves have been irritated so that they jump irregularly; any little irritation, whether it is from over-exertion, or from over-thirst or over-driving, any such thing is often the cause.

MR. SEEDS: Mr. Chairman, I would like to inquire of the Doctor what he would recommend as feed in cases of heaves.

DR. TOWER: I would recommend in heaves that you restrict the dry feed; don't give the horse dry or dusty feed. Moisten the hay and don't give them too much of it. You will find that moist feed will be quite a help, then in addition to this, as a medical aid, I would give perhaps powdered licorice root, about a teaspoonful of that on the tongue. I would prefer it on the tongue because it then goes into the throat and into the bronchial tubes. Again, the oil of tar is recommended.

MR. SEEDS: Mr. Chairman, I would like to ask the Doctor whether in such cases neatsfoot oil would be helpful.

DR. TOWER: Yes, in small quantities.

A Member: Is it not a fact that there is less of that trouble now than there was in former times.

DR. TOWER: I think so.

MR. SEEDS: Mr. Chairman, I would like to make another inquiry of the Doctor. We had a veterinary down to our place looking at a horse in a case where the horse declined to eat, and they didn't understand why, and he showed me where the inside of the horse's mouth was all cut and bloody, which was caused by a sharp tooth, a ragged edged tooth.

DR. TOWER: The teeth of a horse are the great instrumentalities which prepare the food for digestion and mix it with the saliva. Such a condition as you describe is quite common and it has not got to be an old horse either; sometimes the teeth on the outside of the upper jaw become elongated and very sharp. The upper jaw is somewhat wider than the lower jaw and those teeth will become sharp which will sometimes result in the sides of the cheeks becoming lacerated. Now if there is a rubbing of the cheek on a

sharp tooth until they become lacerated, you will be apt to find as a result that the horse will not eat. Only a little while ago a man came from about twelve miles away to see me and he said, "There is something the matter with my horse's tongue." I opened his mouth and turned the tongue up, and in that tongue was a gash at least an inch and a half long, which was full of oats and feed that had lodged in there. When I came to look on the lower jaw and examine the teeth, I found there was a sharp tooth which had cut the gash in the tongue.

MR. ORR: Mr. Chairman, I would like to inquire of the Doctor if he can show us from his diagrams how to operate on a cow bloated from clover.

DR. TOWER: Yes, I can tell you how it is done and give you a very reliable remedy. Here you will see the ribs are shown. You can see here on this diagram where the ribs begin. Now just about half way from the hip bone to the ribs is the proper place to operate with a trochar—about as far as from the top of the backbone—for instance, it would be about there (indicating).

MR. SEEDS: On which side?

DR. TOWER: On the right side.

The SECRETARY: How do you point your trochar?

DR. TOWER: You will find there will be spots where it will be puffed up, perhaps a little more in one place than in another, and that will enable you to judge; as I say, about at this point (indicating) is right.

A Member: Wouldn't it do to use knives?

DR. TOWER: It has been done with knives, but I would not like to use knives.

If you stick a knife in here you are taking chances that I would not like to take, as the stomach is acting right along, and you may do a serious injury. If you take a trochar and insert it through there as I have indicated, it will be safer.

A Member: If you take a knife and insert a tube, wouldn't that do?

DR. TOWER: Yes, that would be all right; but before you put that tube in, they may be an inch apart—those two holes—on account of the motion.

DEPUTY SECRETARY: Mr. Chairman, we have fifteen minutes to devote to this subject, so that it will be necessary to make the questions brief.

MR. HOOVER: What is the cause of a horse having the habit of stall kicking when he is perfectly safe with a driver?

DR. TOWER: Well sir, I couldn't answer that, nor any other man, safely. I will answer that in this way: I know a gentleman who will go out in company and he is the nicest gentleman you ever

saw, and when that man gets home he is the biggest kicker you ever saw. Now I have an idea that horses are a good deal the same way; there may be a little skin trouble, a little irritation somewhere, so that when the horse is standing, it causes him to act in that way. It may come simply from a habit.

MR. SEXTON: Doctor, in case of tuberculosis—you spoke of animals dying from tuberculosis when the lungs are not affected. Now then, what I want to know is this: Would the flesh be as badly affected if the lungs were not affected, as it would be provided the lungs were affected, and your animal had tuberculosis badly.

DR TOWER: The flesh would be bad under any conditions. Where animals become emaciated from tuberculosis it does not matter that the lungs may not be affected, the meat is bad in all such cases. Take the liver, for instance, the liver is one of the main glands of the body, and if that is affected, it will produce the usual evil result. It does not matter what organs are affected, if the disease is continued and is generalized, the meat is certainly bad.

We have some cases where the meat has been found to be wholesome, where the disease is confined to one little spot, perhaps, or two, but has become insistent, so that the germ is not strong all through the system.

A Member: What causes spasmodic colic?

DR. TOWER: It may come from different sources, from overwatering or feeding or a change of feed, anything which irritates the delicate mucus membrane may cause spasmodic colic. When the stomach is not doing its work properly, when conditions are such that the food is not digested properly, you are liable to have spasmodic colic.

The SECRETARY: Any nervous excitement will reduce the power of digestion, and of course that may produce colic.

Dr. Tower stated in answer to an inquiry as to a remedy for colic, that you should give a horse affected with colic equal parts of ginger, gentian and bicarbonate of soda.

A Member: Do you advise the feeding of ground grain to a horse, and if not, why not?

DR. TOWER: I will tell you why I advise feeding ground grain in some cases, and then I can tell you why and when I do not. If you have a horse pretty well along in years, it is a little better to aid his digestion by helping him grind it. You can take another horse, equally as old and ground grain does not agree with him. It is just as I said in the beginning, you have got to study your horse. I would like to have ground feed as a rule for horses that are working, and I would feed oats and corn with a little bran mixed with it, increasing the meal proportionately as you increase the heavy work.

MR. ORR: Would you use some molasses with that ground feed?

DR. TOWER: I am not much of an advocate of molasses as feed.

A Member: How about ground linseed oil cake?

DR. TOWER: I am not much in favor of it.

MR. BEARDSLEE: Doctor, can you describe the process of milk secretion and its delivery into the udder?

DR. TOWER: I haven't the time to do that.

MR. BRODHEAD: Doctor, in reference to a horse not having their teeth in proper shape, is not that the cause of colic in a horse?

DR. TOWER: In about eight cases out of ten, I would say that colic comes from bad teeth.

Now I will not detain you long but I have a little more to present to you in the paper that I have prepared. Referring again to the cow, let me say again that she is the most complicated piece of machinery that was ever built. If this be true, then the man who takes upon himself the care and management of this animal, must be a machinist of the highest order. He must be able to select, or in other words, build up a machine that is capable of earning more than it consumes. He must know what kind of feed or fuel, if you please, to use in order to get the power. The man who runs the steam-engine has only the one machine in his charge, and when once he is become acquainted with its workings, he has mastered the situation. If a certain part of the machinery breaks or becomes worn by use, duplicate parts can at once be obtained. Not so with the dairyman; he may have forty or fifty of these complicated animals in his charge, and no two require the same treatment or care. The farmer may study the needs of one cow and be able to say for a certainty just what she requires to keep her in perfect condition and at the same time pay the most profit, but when he comes to cow No. 2, he finds another problem and so on through the herd.

If we were to go to the National Museum and see the first locomotive that was built and compare it with those of to-day, we would scarcely think they were made for the same purpose. Exactly so with the cow; her outward appearance does not present such a marked contrast, but her earning capacity has been greatly increased. We can remember when a cow that could make one pound of butter in a day was considered a wonder. Now if a cow will not make four or five pounds in a day, she is no good.

Years ago anything that had a head and horns on one end, a leg on each corner and a tail on the other end, was a cow, one just as valuable as another. Nobody knew what amount of butter fat her milk contained. Nobody knew or cared what a balanced ration was.

What has caused the change? It has not come by chance, it has come by close, hard study, by experience, by using the different kinds of food to see which would produce the most milk. A few years ago, if a cow sold for $100 it was considered an exorbitant price. Not long ago H. D. Roe, of New Jersey sold Aggie Cornucopia Pauline for $5,500. You may say this is simply a fad; if so, then

why not devote a portion of our farms to raising fads? Those who have studied the wonderful mechanism of the animal frame cannot fail to admire the marvelous structure, exact proportion, and given use of every part, and to realize the fact that only a Supreme Being and an All Wise Providence could have brought into existence such a masterpiece of creation. To abuse such beneficence is no light sin; to keep the structure in repair is, to the right-minded man, a sacred and pleasing duty.

The subject of health and disease, if dealt with from a practical point of view, must of necessity occupy a very wide range. Health is known as that condition of the body in which every function is performed in a natural and proper manner, where each one acts in harmony, without deviation. As in human beings so in animals, a varied condition of health may be present.

The different breeds of animals, for instance, are marked by peculiarities of health, and this is readily accounted for by the great number of external influences to which the body is exposed. A due supply of proper food, a sufficiency of pure air and water, a certain temperature, light, shelter, cleanliness, exercise; these and their opposites, separately or variously combined, are in constant operation to promote, impair or modify health. These in themselves have an important influence on the condition of those even whose bodies are originally free from defect. Animals have been too much left to the tender mercies of those who are utterly ignorant of their structure, the true nature of their ailments and the proper treatment of them. True, at the present day reformations have taken place, but we are, nevertheless, constrained to admit that deficiencies do exist and disease continues to be nursed.

The amount of disease due to sanitary neglect has been and still is immense. A defective drain, an ill ventilated cowhouse, a damp or exposed sheepfold, a badly constructed stable, are often the unsuspected roots of many fatal maladies. Prescribed medicines are given and advertised, cure-all drug chests are ransacked to remove the effect while the cause is allowed to remain undisturbed. The old proverb "An ounce of prevention is worth a pound of cure," still holds good. The evil influence must be avoided, or disease still continues to exist.

Unfortunately some form of disease is ever present in this country. Perfect immunity, so far as history shows, never has been, and it may be reasonable to suppose, never will be known, so long as animals exist; however, we have the means within our reach to lessen mortality and in many instances to altogether prevent animals from contracting disease. It behooves us to keep a careful lookout for predisposing causes, and when discovered, to avoid them as far as possible, and when unavoidable, to adopt means whereby they may be modified.

There are many diseases over which medicine has very little control, but the cause of which, when ascertained, may be avoided. By detecting a spark, before it is fanned into a flame, we may, in some cases, be able to eradicate all that is mischievous or dangerous.

The CHAIR: The next number upon our program is entitled. "Commercial Orcharding." We will now have the pleasure of listening to Dr. J. H. Funk, of Boyertown, Pa., who will talk to you on this subject.

Dr. Funk presented his paper which is as follows:

## COMMERCIAL ORCHARDING.

By DR. J. H. FUNK, *Boyertown, Pa.*

On seeing this heading, the first impression is, that it means a large apple orchard planted for commercial purposes. Yet it may just as reasonably mean a peach, pear, cherry, or plum orchard, as all of these are planted on a very large scale, covering hundreds of acres, and are therefore classed as commercial orchards. Either of these might be called an apple orchard, without having a single apple tree in them, as the term apple means fruit in general, especially all that of a round form.

That king of fruit, the apple of our day, belongs to the genus Pyrus Malus. It is supposed to have its origin in Europe. Pliny mentions twenty-nine varieties of apples being cultivated in Italy about the beginning of the Christian Era. It is doubtful if one of these varieties exist at the present time. They have disappeared, and are superceded by newer sorts, of higher merits. Evolution, constant change, is the law of nature. In this country the majority of our choicest fruits have originated by chance, by the accidental crosses of good varieties, by the intervention of insects, the honey-bee being one of the great factors in cross-polinization. To this industrious little friend do we owe a debt of gratitude for its instrumentality in giving us many of our choicest and most delicious fruits, as well as the thousands of beautiful flowers, with their bright tints and sweet perfume, rendering our homes a paradise.

The apple, though introduced into America from Europe, has gone through so many changes that the majority of our cultivated varieties to-day are of home origin, showing that our seedlings, grown and acclimated in America, are much better suited to our conditions than are those introduced from other countries.

The adaptation of varieties to location is of great importance. Of the hundreds of varieties of American origin which are grown in the United States, but very few are found in the commercial orchards of any one State.

Varieties that are commercially most valuable in the New England states are not profitable in Pennsylvania; and many of those of Pennsylvania are worthless in Arkansas. The Wealthy which is a fine winter apple in Minnesota, is a very poor summer apple below latitude 40 degrees. Just now numerous varieties of apples and other fruits are coming rapidly into existence, and many of them very valuable to the localities where they originated. These facts have given great impetus to the intelligent breeding of varieties and the selection of bud variation that show particular adaptability to any given locality. The individual intending to plant a commercial orchard should bear this in mind, that all fruits mature earlier by moving them southward, and later by planting them farther north. If he lives in latitude 40 degrees, he cannot profitably plant Baldwin, Greening, Northern Spy, and such varieties especially adapted to latitude 42 degrees; but he can safely

plant many varieties that originated farther south, with the assurance that their season will be lengthened. He should also bear in mind that altitude is a factor of considerable importance.

To be successful in fruit growing, several very essential things must be observed:

## LOCATION.

In setting out a home orchard, convenience to the buildings takes precedence. Any piece of land lying adjacent to the buildings and not too wet, is given preference. But for a commercial orchard it becomes a business proposition, which means success or failure; therefore, location is looked into carefully. Never take a low, flat-bottom land on which water stands part of the year, or through which a slow sluggish stream runs, the danger of winter killing and late spring frosts is too great. Select a gentle, sloping hillside in preference. Cut away all close surrounding forest. Many think a windbreak on the north and west will be a great protection. Have you not noticed the terminals and bloom always suffer most, close to the wood and in the valleys, because they interfere with air-drainage which equalizes the temperature, lessening the danger from frost during the blossoming period? We never fear frost on a windy night; so where we have good air drainage, the air, as it becomes cool becomes heavier, and runs down the same as water, to be replaced by the warmer air from below. This causes an agitation of the atmosphere, and removes the danger of frost. A thermometer placed at the higher point registers considerably higher than one placed at the foot of the hill. The meadows and valleys will be covered with frosts, when but a few feet higher none will be visible.

*Exposure.*—Opinions differ greatly; some advocate a southern exposure as being less liable to injury by our severe winters; others prefer a northern exposure, claiming it retards the flow of sap in Spring, preventing the buds from starting should there be several warm days during March, which if followed by severe cold, would freeze the tender buds. I have every exposure, N., S., E. and W., in my apple and peach orchards. I find no difference in time of blooming or danger from cold, as I have had no failure so far in 35 years from any of these causes, on any exposure. It all depends on the condition; if your trees are well fed, cultivated, pruned and attended as they should be, you need not fear damage or loss, unless the winter is unusually severe, reaching 20 to 30 degrees below zero.

## SOIL.

The apple is a gross feeder, but adapts itself to circumstances. It thrives upon our mountain ranges; in the limestone valley on the sandstone and shales; upon the alluvial deposit in our river bottoms; the vast prairies; from the granite hills of New England, to latitude 32; from the Atlantic to the Pacific Coast; the apple does well, but all varieties do not thrive equally as well in all these locations. Every locality has some particular variety that seems especially adapted to that section. And it is important that the orchardist familiarizes himself with the nature and habit of each variety, that he may select such varieties as are best adapted to

his climate and soil: therein lies the profit. There are many soils in every district so entirely unsuited in the condition we find them, that it would be folly to plant any variety; but in very many instances the objectionable features may be entirely removed, or changed. Compactness, may be overcome by mechanical means by the application of humus, exposure to the elements; missing elements may be supplied; excessive moisture may be removed by ridgeing, or by underdraining, thus carrying off all surplus.

Soils that are porous, permitting the surplus water to penetrate, are most suitable for orchard planting. These may be designated as gravelly, sandy, or sand loam. Others are more compact, made up of finer material, clay, which permits the water to penetrate very slowly, and requires very different treatment. By back farrowing, throwing up a ridge upon which to plant, or by underdraining and turning under plenty of material to make humus, this soil becomes more porous and becomes peculiarly adapted to the production of certain varieties of apples, as certain apples do much better upon clay or clay loam; others upon limestone, granite, etc. One variety may give abundant crops of the choicest fruit upon a granite formation, and be utterly worthless upon a shale, or sandstone formation. Therein lies the value of understanding the individuality of the different varieties.

*Preparation.*—This should ordinarily be begun the season previous. If the soil is lacking in humus, which is the foundation of fertility, it should be well covered with good stable manure, thoroughly and deeply plowed, and planted to some hoed crop, corn or potatoes, the latter being the better. Apply complete fertilizer of high grade, at least 1,000 pounds per acre. As soon as the potatoes are removed, sow to cow peas, or some other quick growing crop; this may be turned under late in fall, or left as a winter mulch on top and turned under early in spring, plowing not less than 10 or 12 inches deep, harrow thoroughly and roll, which places it in excellent condition for planting.

*Selection of Stock: What Age?*—If peach, never take a tree over one year from the bud, but good, strong, healthy stock, 4 to 6 feet high, with clean bark, clean roots, free from root galls.

If apple or pear, select one year old in preference, if you can get strong 4 to 6 feet whips. The reason for this choice is, when you get trees of this size at one year old, you have trees of strong, robust habit, strong individuality, the very cream of the nursery. They can be dug with less injury to the roots; you can form the top at any height you desire; you can form a head any shape you wish, having no forks, which should be avoided, as they are apt to split when they are heavy laden with fruit. It is almost impossible to get trees with heads formed in the nursery that will suit the orchardist who understands his business.

If you cannot get one year old trees as described, take smooth, thrifty two-year old trees, that have low, well formed heads. It is advisable to place your order early with some reliable nurseryman, or dealer, before his stock is reduced, as too many will substitute rather than lose the order, and substitution is what you wish to avoid, for if you have made a careful selection of just what you want, you want that order filled to take the letter, and do not wish to have some worthless variety, which the nurseryman says is just as good,

(because he happens to have a surplus of that variety), palmed off on you.

*As to Varieties.*—Make a canvass of your neighborhood, see what varieties are regular bearers, of good sized showy apples, of good quality. Make inquiries of some one who is well versed, on fruit suitable to your locality. No matter how good an apple you get, if it be a poor bearer, leave it alone; on the other hand, no matter how good a bearer a variety is, if it lacks quality and beauty, do not plant it. The time has come when people's tastes are becoming cultivated, and such apples as Ben Davis, etc., are not wanted.

In selecting varieties, if for family use, have a succession, from early, until late. You can have apples the year round.

If for commercial purposes, do not plant too many varieties. Plant a limited number of select fall varieties, as there is a time when choice fruit is scarce, and brings high prices. These can be supplied by planting Jeffries, Gravenstein, Summer Rambo, Wealthy, and Smokehouse, all choice fruit of highest quality, trees hardy and heavy producers. These are followed by Hubbardston, Nonesuch, Jonathan, Grimes' Golden, Kinnard's Choice.

For winter, plant heavy of Stayman's Winesap (of this variety you cannot plant too many), York Imperial, Rome Beauty, Salome, Nottingham Brown, Nero, Mammoth Black Twig. If you are planting north of 41 degrees, you can add Baldwin, Greening, King and Northern Spy. There are many other excellent varieties in every locality, but from those given the planter can make a selection, that for productiveness, quality and profit, cannot be excelled.

*When Shall We Plant?*—We can generally get the best stock in the fall of the year, more likely get varieties we want; we also have more time at this season, and the work is apt to be done better. For the hardier fruits, such as apple, pear, cherry, etc., also currants and gooseberries, I believe this is the best season, giving the roots, where cut, time to callous, and often start new roots weeks before the leaves appear, and are thus better able to overcome the severe shock of transplanting. When planted late in the spring, the buds expand and leaves form and often pump out the stored up vitality, faster than the mutilated roots can furnish moisture and food; then should a dry season set in, as it so often does, the tree suffers very severely and frequently dies.

*How Shall We Prune?*—First, the roots that are bruised and mutilated should be cut back, leaving stubs from 3 to 6 inches. Anything beyond 6 inches is superfluous. The Stringfellow method of pruning, if you are north of latitude 38 degrees, leave it alone; enticing as it may appear, failure is almost inevitable.

Cut all tops back proportionately, if one year old apple and pear. Cut back to two feet stubs. If two year old, with tops already formed, cut limbs back to mere stubs, cutting off immediately above an outside bud, so as to give it an open spreading head. On visiting my orchards, both apple and peach, the visitors' attention is first attracted to the spreading open heads, and they wonder how I get them so. Care in pruning is the whole secret. A good sharp knife is a wonderful instrument in the hands of an intelligent, practical horticulturist. As you can prune for wood growth, prune for fruit, early bearing and many other things.

## PLANTING.

Never plant in sod, unless you wish to utilize a steep hillside or rocky piece of ground. If such is the case, then dig large holes, placing the surface soil on one side, the subsoil on the other. Set the tree about one inch deeper, than it originally stood, putting the good surface soil, supplemented with bone meal, in below and over the roots, filling the poorer soil in above. Mulch the ground heavy with straw manure, to keep moisture, and the surface loose, also to furnish fertility. If the ground is plowed and in good tilth, then open deep broad furrows with plow, and plant the young trees therein.

*Distance.*—A great diversity of opinions exist as to the proper distance trees should be planted in an orchard. Many plant 40 feet apart, claiming when mature, the tree needs all this space for the spread of its roots in search of food, also giving room for the limbs to spread, giving plenty of circulation of air and sunshine, that fruit grown on such trees bring better fruit, of brighter color and higher flavor. Others claim that this distance is unnecessary, that 30 feet is far enough for any orchard, and more a waste of land.

In many commercial orchards they plant 35 to 40 feet apart for permanent trees, then plant fillers between, making three fillers for every permanent tree. In the large Western orchards this method is in vogue, planting such varieties as come into early bearing, such as Missouri Pippin, Grime's Golden, Wealthy, etc. In sections where the peach does well, peach are planted as fillers. After these fillers have borne several crops, or when the trees begin crowding, the fillers are removed, giving the entire space to the permanent trees.

I am frequently asked whether it is advisable to plant fillers. It is doubtful if apple fillers ever prodnce sufficient before removed to pay for care and expense. With peach it depends on the man, whether he has the moral courage to cut them out in time to prevent injury to the permanent trees, especially if said fillers are paying $10.00 to $15.00 per tree. I have gone through this and know whereof I speak.

I think 35 feet is about the proper distance for apple; 25 feet for pear; 20 feet for peach, plum and sour cherry.

## CULTIVATION.

In former times cultivation was thought unnecessary, but clean culture is now acknowledged best by all intelligent fruit growers. During the early stage of an orchard, if the lay of the land permits, and the owner prefers, he may plant some hoed crop for a few years, applying plenty of fertilizer to keep up the fertility of the land. But, if not financially necessary, the best results can be obtained by clear culture in the spring, then sowing to some leguminous crop to mulch the ground over the winter, to be turned under in the spring, which adds humus and breaks up the mineral elements in the soil, appropriating them to its own use, to be returned to the soil in a more available form, abstracting large quantities of nitrogen from the air, and thus enriching the land. When the orchard comes into bearing, the raising of leguminous crops cannot so well be done. Then it is best to seed to grass and leave this cropped short, keeping all clippings on the ground. Or the land may be

mulched by hauling foreign matter, as spoiled hay or straw, on the ground. The best showing I ever had from mulch was from a three inch covering of second crop clover hay, after the seed had ripened. The seed kept reseeding the ground for several years.

For peach, I prefer the dust mulch, going over the ground both ways in early spring, while the ground is loose, with a sharp spring tooth harrow. This can be done even when trees are so large that the terminal shoots meet, by dividing the harrow and placing a steel frame between the two sections, thus enabling the team to pass through the middle, while the harrow passes under the limbs, close to the trees. After the land is broken loose, the cultivation is continued with a three section spike tooth harrow, taking a full width space with one passage. This is kept up two to four times a week until in July, always keeping a dust mulch, never leaving a crust form, the cultivation not to exceed three inches in depth. The drier the season, the oftener you cultivate, as you thereby prevent evaporation and retain the moisture for the use of the tree. This may, in dry season, be continued until the 10th of July; but continuing later will be detrimental to the tree by keeping up the growth too late to properly mature its wood, then should the winter be severe the tree suffers greatly.

*Thinning.*—This is very essential for successful, profitable fruit raising. Trees frequently set so much fruit, that if left, will so impair the vitality of the tree, that the present crop fails to attain its full size and flavor; also fails to make the necessary wood growth and develope good strong buds for the following season. It frequently happens such a tree sets sufficient buds showing abundant bloom the following spring, but, lacking vitality, drop without setting fruit. The fruit matured lacks in size; frequently one-half developes, the other half stops growth when half-size, remains insipid and tasteless, whereas if three-fourths had been removed when less than one-fourth grown, the remainder would have increased in size, yielding as many bushels of fruit, of superior quality, bringing three times as much money to the producer. Choice fruit never gluts the market. It is the poor, insipid, worthless trash that ruins the market, as well as impairs the health of the consumer. It is not the edible part that reduces the vitality of the tree, but the seed. The edible part is made up largely of water. When you reduce the number, the tree having so many less seed to mature, throws all its energy into developing the pulp or edible part, and stores up all surplus vitality in good strong buds for next season's crop, thereby giving you a full crop every year. An off year is not in accordance with Nature's plans. If one fails to materialize (unless something unusual, such as a severe freeze in blossoming time, or a continual rainy week while the tree is in bloom, occurs), something is radically wrong, showing gross mismanagement. Many may think this is unavoidable, but a tree properly pruned, sprayed, fed, etc., is able to withstand hardships that would be fatal to the tree neglected, as most trees are. I know whereof I speak, not having a failure in a fruit crop in thirty odd years.

## INSECT ENEMIES.

These are the bane of the fruit raisers' life; and there are so many of them. Fifty years ago a large proportion of these pests

were unknown, or in such small numbers that little damage was done; but, with the importation of new fruits and vegetables, these different insects were imported with them. We have the San José Scale from China; the Codling Moth from Europe; and many others that time will not permit us describing. But these two are the most dangerous, and unless the orchardist fights them with the most approved machinery and the best insecticides, he had better give up and leave fruit raising to the man who has the brain and push to do effective work.

*Remedies.*—During the last few years so much has been written, talked about, demonstrations held throughout this and other states about the San José Scale and how to control it, that there seems little more to add. Formulas have been given by the score; lime, sulphur and salt, cooked and uncooked, by kettle and steam, how to apply it, and when to apply it; oils, soluble oils, emulsions, soaps, etc., have been extolled. One would think the little insignificant pest would have surrendered long ago, yet strange to say, there are still a few left, enough to make it interesting.

Why is this apparent lack of success? There are several reasons, such as poor material, poor machinery, poor man. The two principal causes are poorly prepared material and poor application. The average farmer is so used to doing things in a careless, indifferent way, he thinks a few small details left out will make no difference in final results, so he wastes a little time, a little money, and accomplishes nothing; then "cusses" the professors, scientists, and specialists as a set of imposters. Lime, sulphur, and salt is now conceded, when rightly made, to be a sure remedy.

*Its Time of Application.*—Instructions are given to apply any time after foliage drops until buds expand, some advocating fall to be just as good as spring. Do you know that term "just as good" disappointed many a man? The fall is all right for the apple and pear, but for the peach it is dangerous. This past season hundreds of peach trees sprayed in October and November were seriously injured, not only the buds but the new growth? Last fall I sprayed about two hundred peach trees. I can estimate my loss at not less than $100.00 on this season's crop, and a greater loss in future. The injury shows at a distance; trees full of dead limbs; all bearing wood inside the tree killed; high limbs that received less of the spray are alone producing their full crop. The symmetry and productiveness of the tree is destroyed. Too much care cannot be taken, to give no advice, unless it has been tested, what is food for one, may be poison for another.

The man who abuses a confidence should be held criminally responsible for his neighbors' loss. If such were the case, there would be less rubbish published in our papers.

*The Codling Moth.*—There is more loss to the fruit grower from this insect than from any other insect we have. The loss annually can be estimated at millions of dollars; yet the greater part can be saved by judicious spraying with an arsenical poison, just after the petals fall, and again a few days later.

Fungi can be treated by Bordeaux mixture, combining the two and applying at one operation.

PROFITS.

I have left this important item for the close. Yet it is one of such vital importance to the individual about to embark into any enterprise. Does it pay? Can it be made to pay that it should be a first consideration? In answer to these questions, I will say for the intelligent, industrious, painstaking man, one possessed of good business traits, there is no other business enterprise that offers such sure and satisfactory returns for time and money invested, than a well selected, well trained, and well fed orchard. There are hundreds of them, from Canada to the Gulf of Mexico, from the Atlantic to the Pacific Oceans, that have been, and continue to bring in to their owners, princely incomes. There is no other business started with a small amount of money that grows so rapidly. No other business, while paying large dividends, lays by a sinking fund so rapidly.

The lowest estimate on horticultural value is one dollar per tree, per year, for the first thirty years. That means one acre of land planted with thirty-five trees would be worth, at that time, the large sum of $1,050.00. Will it pay interest on this?

At this age, a minimum crop would be ten bushel. In favorable seasons, and with good attention, it will treble this. At ten bushel per tree means only 350 bushel per acre. At 50 cents per bushel (price of common apples), means $175.00 per acre, or over 16½ per cent. interest on horticultural value. Many orchards pay for themselves and pay these dividends before attaining the age of ten years. Time will not permit of going into details on the profits of commercial orcharding. If there are any "Doubting Thomases," I can give them the names of scores of successful growers to corroborate my statements.

I will give data, secured in Orleans county, N. Y., showing yield and income from orchards sprayed different numbers of times:

| How Treated. | Yields. | | | | Income. |
|---|---|---|---|---|---|
| | No. of orchards. | No. of acres. | Average yield per acre. In Bu. | Portion of crop barrelled. Per cent. | Average income per acre. |
| Unsprayed, | 43 | 381 | 328 | 66 | $103 00 |
| Sprayed once, | 33 | 352 | 346 | 74 | 139 00 |
| Sprayed twice, | 70 | 701 | 374 | 78 | 143 00 |
| Sprayed three times, | 27 | 247 | 414 | 87 | 184 00 |
| Sprayed four times, | 6 | 43 | 569 | 77 | 211 00 |

The orchards above mentioned were, of course, otherwise well cared for. Such instances can be given in nearly every state.

MR. SEAVY: Mr. Chairman, I would like to ask what is the cause of the bark of young apple trees four or five inches through, split-

ting. The bark splits clear to the grounnd on the trees, splits almost straight down in April.

DR. FUNK: You find it just with certain varieties, do you not? The Hubbardston and Nonesuch will do it to a limited extent. We find it in certain trees that are not adapted to certain localities. In the selection of varieties they must be chosen with regard to the particular locality.

QUESTION: Will Stayman's Winesap do as well, and be of as high quality in southwestern Pennsylvania, on a soil of a sandy clay formation, as in your own locality? Do you know of the Banana apple being fruited in southern Pennsylvania? If so, what is your opinion of it?

DR. FUNK: Stayman's Winesap, you must understand originated in Kansas. It is an apple peculiarly adapted to the north; no matter how far north it has been tried, it has been a success. We have certain kinds of fruits which are adapted to all soils and climates, and we should not hesitate to recommend Stayman's Winesap to any man in any locality where apples will grow. It is hearty, a heavy bearer, and of the highest quality, and if you will fertilize well, getting plenty of phosphoric acid in your soil, you will get the color.

I know nothing of the Banana apple being raised in Pennsylvania. In York state it is raised and considered a very good apple.

MR. MORRIS P. HALLOWELL: When is the best time to prune an apple orchard? Does it hurt to prune after sap starts? What will it cost to spray 10-year old trees?

DR. FUNK: You can prune the apple orchard at anytime during the year. If you are pruning for wood growth, you can commence in the fall and prune anytime during the winter and up to late spring. If you are pruning for fruit, it is best to prune in June. You understand that a fruit bud and a leaf bud are to a certain extent interchangeable; you can convert a fruit bud into a leaf bud and can convert a leaf bud into a fruit bud just by your method of pruning.

A Member: You can change a leaf bud into a fruit bud if you take it early in the spring.

DR. FUNK: Certainly you can. You may have a leaf bud developing and if you stimulate that soil by giving it a good nitrogenous fertilizer, and you cut that limb off immediately above the leaf bud and you develop a fruit bud from that. On the other hand if you have a leaf bud and your tree is not coming into fruiting, if you will tie a band around there, you will convert that into a fruit bud. You can control a tree just as you want it by pruning and by attending to it properly at the right time.

MR. T. L. WALL: Is it possible to treat San José Scale at this time or in June, if so, how?

DR. FUNK: Certainly it is; but the best time to treat it is while the tree is dormant, and lime, sulphur and salt is the best remedy.

If the trees have been inoculated and you find about the 15th of June, or perhaps a little bit later, that they need attention, then you can use some emulsion; use the kerosene emulsion, or use the soaps. Wherever you use the oil, use it in emulsified form with soap and water.

QUESTION: What variety of peaches would you set in northwestern Pennsylvania?

DR. FUNK: Set varieties of the North China type, the hardiest of all the type of peaches that we have. If you take the Persian type or the Honey type, you will find they are not hardy enough, but by taking the North China type, you can commence early or take the Carman, that will withstand a temperature running down to at least twenty degrees below zero without injury, and it is an enormous bearer of fine, large select fruit. Plant with them for about your earliest. There are still earlier ones, but they cannot be depended upon. You can follow that with the Highland, and that can be followed by the Champion; then comes the Belle of Georgia. You can follow that by the Captain Eads. Those are peaches that are all extremely hardy. They are all heavy bearers and of excellent quality. The first one I gave you is a Summer Queen, one of the very first early peaches here, and coming in so early that it is wanted by every one, and it will bring big prices.

MR. CLARK: Mr. Chairman, I would like to inquire of the Doctor what his opinion is of the Elberta?

DR. FUNK: We raise them, but if you once plant Captain Eads, you will never plant another Elberta. The Elberta is large, it is beautiful in appearance, but its quality is not first-class. When you come to the Captain Eads, it is more uniform in size, and you will find it will produce an enormous crop of uniform peaches, so that you may pick a hundred baskets and you can hardly make a selection, which one is the nicest. It is a better quality than the Elberta, and whenever I have sold the Captain Eads to anybody, they always want the Captain Eads again as a yellow peach.

MR. CAMPBELL: Would it be safe to plant largely of York Imperial and Stayman's Winesap in northern Pennsylvania at an altitude of 1,200 feet, clay loam soil?

DR. FUNK: I would risk any quantity if it was on well drained land, or I could well drain it. I would risk either one of them on a sloping hillside.

QUESTION: Would you top-graft Ben Davis that are bearing with some other apple?

DR. FUNK: Yes, and you will have God's blessing upon you if you do.

MR. MILLER: How do you thin on a large apple tree?

DR. FUNK: Now that is something that you very seldom need to do, if you have started the orchard yourself and have got it into the annual bearing habit. Our young apple trees we always thin them until we get them established in regular bearing.

QUESTION: Can the King apple be grown in any soil and climate?

DR. FUNK: If you live below latitude 41 I would advise you not to touch a King apple; they are not adapted to the climate below that latitude.

MR. GLOVER: Is it advisable to sow alfalfa in an orchard of ten years' growth?

DR. FUNK: I would rather sow any other luguminous crop, as for instance, take crimson clover, or take any clover, I would prefer it to alfalfa in such an orchard.

MR. KILLAM: In what portion of this State is the San José Scale the worst? We have none in Pike and Wayne counties.

DR. FUNK: Well, if its worse any other place than it is down in our section of the country, I don't know—it is certainly pretty bad.

MR. MILLER: Does it exist in all counties? I understand that it has not been found in Somerset county yet.

DR. FUNK: I think if a proper examination was made, you will find that county is not exempt.

QUESTION: What are the best varieties of peach trees which will bear the most severe cold?

DR. FUNK: I have already answered that question.

QUESTION: Is it not too late to grow a crop of cow peas in an orchard after potatoes are out?

DR. FUNK: No, I am going to sow if the weather is fit, next week, using the Whippoorwill variety. You can take the Black Eye and some of those varieties that mature quickly and it is all right.

QUESTION: What varieties of pears would you advise for Clearfield county?

DR. FUNK: If you know how to raise them, I would say the Keiffer pear, then pick it at the right time and it is as smooth as any Bartlett pear you ever ate. It is of excellent quality and will bring prices equal to any Bartlett pear. Of course if you want it for home use, you want it for a selection, and you will get nothing better in quality for that purpose than the Seckle pear. The Bartlett Seckle is another pear that can be recommended, and the Duc D'Anjou is another pear that is all right. I maintain that all fruits are annual bearers when properly attended to.

QUESTION: What is the trouble with the cherry trees? For the last two or three years they are all dying off?

DR. FUNK: That is only the sweet varieties, is it not? You take the common wild cherries and the sour cherries and we can do well enough with them in our section of the country, but we can't do anything with the sweet variety, and the only plan is to

keep the trunk shaded from the afternoon sun; in that way you can avoid the splitting of the bark, otherwise you cannot do it.

MR. SEEDS: Doctor I have got seventy-five grape-vines around my wire fences. Now how would it be to gather the stones on that orchard and mulch every other grape-vine? I have got a stone pile on every other grape-vine.

DR. FUNK: I would prefer to mulch with alfalfa or clover or anything of that kind.

MR. SEEDS: I can't cultivate it, it is pretty steep, you know. It's pretty hard to keep the stones from rolling off the farm.

DR. FUNK: How do you do with your grapes, squeeze the juice out and let it run down hill?

MR. WATTS: Mr. Chairman, I would like to ask the Doctor a question. Would like to know whether in a commercial orchard, for instance, you would plant Stayman's Winesap or the York Imperial or the Spy in blocks of four or five hundred and will they do well if planted in that way?

DR. FUNK: There is no variety but what is improved by cross pollenization. Take nine-tenths of the varieties of apples that we have at the present time, and they are practically self-serving. You can take many of them and you put one single scion—you may take an apple tree that is a fair bearer and do that, and you will make it a heavy bearer because it is so strong in the pollenizing power; cross-pollenization is an important factor.

MR. WATTS: I have quite a good many Baldwin trees and they scarcely fruit at all, and I have attributed it to that fact.

DR. FUNK: There is an orchard where I think there are seventy-five acres of Baldwin apples; that orchard was unprofitable, hardly ever bore until they took about every third row and topped that with the Rhode Island Greening, and after that it was one of the most productive orchards in that part of the State, showing the benefits of cross-pollenization.

The Chairman announced the Committee on Resolutions as follows:

SAMUEL McCREARY, Chairman,
FRANKLIN MENGES, Secretary,
T. E. ORR,
MATTHEW RODGERS,
AMOS B. LEHMAN,
D. A KNUPPENBURG,
M. N. CLARK.

MR. HERR: Mr. Chairman, I move that we do now adjourn. The motion having been duly seconded and the question put, it was agreed to, and the meeting adjourned to 7.30 o'clock this evening.

Court House, Clearfield, Pa.,
Tuesday Evening, 7.30, May 29, 1906.

The meeting was called to order at the designated hour by Hon. Jason Sexton, of North Wales, Pa., Chairman for the evening session.

The CHAIR: It gives me great pleasure to introduce to you Prof. J. W. T. Duvel, of the United States Department of Agriculture, Washington, D. C., who will now address you on "Good Seed, and How to Obtain It: Adulterated Seed."

Prof. Duvel delivered the following address:

## GOOD SEED AND HOW TO OBTAIN IT.

By PROF. J. W. T. DUVEL, *United States Dept. of Agriculture, Washington, D. C.*

The question of the quality of the commercial seeds of our farm crops, particularly of our forage plants, is one of the most important with which our farmers have to contend to-day. During the last decade the quality of agricultural seeds which have been placed on the market has grown gradually worse, and within the past six months hundreds of thousands of pounds of worthless trash, screenings or misbranded seed has been sold to our farmers and much of it at fancy prices. The low quality of seed is particularly marked in red clover, alfalfa, orchard grass and Kentucky bluegrass. But inasmuch as the farmers of Pennsylvania are but little interested in orchard grass or Kentucky bluegrass, I will discuss principally the quality of commercial red clover and alfalfa seed.

Every man who practices general farming knows that to omit red clover or a closely related leguminous plant from his rotation, almost invariably leads to a failure of crops. Yet, go into any section of the country you please and farmers will tell you that they can no longer grow red clover successfully in their fields. They say their land is "clover-sick," needs lime or some other treatment, they know not what. If the soil is known to be all right, the failures are attributed to unfavorable weather at the time of sowing or perhaps to a drouth later in the season. Undoubtedly any one of the foregoing factors may result in the failure to get a stand of clover, but an inspection of the quality of the seed which is being sold will show that scores of failures can be traced directly to low grade seed. In fact, to one who has examined the quality of commercial seed, it is surprising to know that the failures are not much greater than now reported. Seed of low vitality will not produce plants which will thrive even under favorable conditions. While if the seed is of strong vitality, the young plants will be healthy and full of vigor; capable of producing good plants, unless the conditions are extremely unfavorable. It is safe to say that good seed will almost invariably give a good stand when sown in sections adapted to the production of red clover.

Similarly we find innumerable failures in the growing of alfalfa, the crop which promises to be of inestimable value to our farmers.

Alfalfa has been so highly recommended, and the difficulties of securing a stand so strongly emphasized that most farmers have come to think that a stand of alfalfa can be secured only after one or more failures. If every farmer could know what percentage of the seed sown is pure alfalfa, and what percentage of the pure seed is capable of germinating and producing vigorous plants, then the many reported failures would be viewed in an entirely different light.

For a number of years the United States Department of Agriculture and many of the State Agricultural Experiment Stations have been endeavoring to point out to the farmers of the United States what enormous quantities of low grade clover and alfalfa seed are sold in the market. These efforts have resulted in a marked degree of success, but considering that the quality of red clover and alfalfa seed is poorer to-day than it has ever been before only shows that the American farmers have not made the most of their opportunities in securing a good grade of seed. In order to bring this clearly before you I beg to make use of some charts which show the result of the analyses of a few samples of commercial seed. The first that is to be considered treats of red clover.

Chart I.—Analyses of representative samples of commercial red clover seed which were obtained in the open market.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Broken seed, dirt, etc., per cent., | 4.5 | 1.2 | 2.8 | 3.5 | 3.4 | 10.7 | 11.5 |
| *Seeds not red clover, per cent., | .3 | .8 | 4.2 | 2.6 | 3.6 | 12.2 | 24.3 |
| Number of kinds of weed seeds, | ..... | 15 | 5 | 13 | 19 | 40 | 26 |
| Number of weed seeds per pound, | ..... | 3,253 | 2,057 | 3,719 | 21,156 | 38,334 | 73,765 |
| Pure red clover, per cent., | 95.2 | 98 | 93 | 93.9 | 93 | 77.1 | 64.2 |
| Germination, per cent., | 93 | 94.5 | 91 | 80.5 | 89 | 68 | 71.5 |
| Price paid per bushel, | $8 75 | $8 50 | $8 00 | $8 00 | $7 50 | $7 50 | $6 00 |
| Actual cost per bushel of pure seed which would grow, | 9 88 | 9 18 | 9 45 | 10 58 | 9 06 | 14 30 | 13 07 |

*This may include alsike clover, white clover, timothy or some of the other valuable forage plants, which are not included with the weeds.

*Broken Seed, Dirt, Etc.*—In all commercial seed there is more or less broken seed, stems, dirt, chaff, etc. However in a well-cleaned lot of seed the amount of inert matter of this character need not be large, at least not more than two per cent. The seven lots of seed here represented show from 1.2 per cent. to 11.5 per cent. of inert matter. Samples 6 and 7 contain a high percentage of broken seed and dirt, representing a direct loss of 10 or 12 per cent., which will likewise result in a reduction of the amount of seed sown per acre.

In addition to the presence of broken seed, parts of stems, etc., crushed quartz is not uncommonly found in commercial seeds. These small particles of rock are screened so as to be approximately of the same size and in some instances are stained to be of the same color as the seed with which they are to be mixed. A few years ago there existed in both Europe and America, firms whose business it was to supply unscrupulous dealers with such crushed quartz sand at a cost ranging from $1 to $3 per one hundred pounds. This was then mixed with red clover and ultimately sold as such to our farmers.

It is, however, gratifying to know that this illegitimate practice is at present much less common than it was a few years ago.

*Foreign Seeds, Weeds.*—Aside from the presence of a considerable quantity of broken seed and dirt, the majority of commercial samples contain a large number of seeds other than red clover. In many instances these are seeds of many of our most noxious weeds.

Every institute worker present this evening, however, knows only too well what the presence of bad weeds mean on the farm. Every farmer in the United States, at least every good farmer, realizes that many dollars could be added to his bank account every year were it not for the weeds. They rob the soil of the nourishment which is needed for bringing our crops to the highest state of maturity and productiveness. They crowd out the young and tender plants which cannot survive without the requisite amount of light and air. Likewise, the amount of time spent with the scythe or hoe, cutting thistles, burdocks, cockleburs, plantains, dandelions, wild carrots, wild parsnip and scores of others, is a bugbear to successful farming and particularly to the farmer's boys.

Some of you no doubt want to ask where the weeds all come from. This can be best explained by means of the results of the analyses as shown in Chart I. Sample Number 1 contains no weed seeds, the seed has been well cleaned and is of extremely good quality in this respect. Sample Number 2 contains fifteen different kinds of weed seeds, aggregating 3,253 in every pound of red clover seed. Seeding at the rate of 12 pounds per acre, means that the farmer himself has bought from his seedsman and sown on each acre 39,036 weed seeds, representing fifteen different kinds. This rate of seeding is nearly four times as great as the number of corn stalks on an acre, allowing three stalks for every hill of three and one-half feet. Samples 3 and 4 contain approximately the same number of weed seeds as sample Number 2, yet the number of weed seeds in either of these three samples is relatively small when compared with the average quality of commercial red clover seed. Sample Number 5 contains nineteen different kinds of weed seeds, aggregating 21,156 seeds in every pound of red clover seed. These were made up of buckhorn, broad plantain, barbed plantain, wild carrot, sorrel, curled dock, lamb's-quarters, pigweed, spurge, catchfly, chickweed, pennyroyal, five-finger, foxtail, three kinds of panic grass and two kinds of quack grass. In addition to these there was present timothy, Kentucky bluegrass, white and alsike clover which of course, are not considered as weeds. This sample was offered by a western seed-house as "Strictly Prime Seed."

Sample Number 6 contains forty different kinds of weed seeds and Number 7 contains twenty-six different kinds, the former having 38,334 and the latter 73,705 weed seeds in each pound of red clover seed. Every twelve pounds of seed (an average amount sown per acre) from lot Number 6 contains 460,008 weed seeds, while twelve pounds from lot Number 7 contains 885,180 weed seeds. The former will give 10 weed seeds and the latter 20 weed seeds on each and every square foot of soil.

I think with this there is no longer any question as to where our weeds come from. When they once get into the soil their eradication is a very difficult task. Our seedsmen, you know, are generous and I presume give these as premiums with agricultural seeds,

the same as many of them give the small packages of mixed flower seeds with every purchase amounting to $1 or more.

It is not uncommon to find commercial red clover seed which contains a relatively high percentage of timothy. In such cases the dealer generally succeeds in convincing the farmer that the presence of timothy seed will improve the quality of the pasture and the hay. This may or may not be true, but whenever you find such seed on the market you can rest assured that the dealer is selling you timothy seed at clover seed price? If you wish to sow a mixture of clover and timothy, buy the desired quantity of timothy seed, the best of which should be bought for two or three cents per pound and do your own mixing, thereby saving ten or twelve cents per pound on all the timothy seed sown. The presence of more than a trace of timothy seed means one of two things—either the mixing has been done intentionally in order to increase the profits, or the seed has not been cleaned and is probably a fair indication that innumerable weed seeds are present.

*Pure Red Clover Seed.*—By pure seed is meant the amount of whole seed of the kind examined whether it be immature and shriveled, discolored or good plump seed. The only matter excluded being the broken seed, dirt, stones, sticks, chaff, etc., and all seeds not of the kind examined. Sample Number 2 in Chart I, shows 98 per cent. of pure seed, and there is no reason why a good grade of red clover seed should be less than this. Sample Number 1, however, while not so high in either purity or germination, is given first place owing to the absence of weed seeds. The .3 per cent. of foreign seed as indicated in sample Number 1 consists of alsike clover and a few timothy seeds, which are not objectionable when present in such small quantities.

The amount of pure seed contained in samples Numbers 6 and 7 is only 77.1 and 64.2 per cent., respectively. Such samples as these are considered as very low-grade seed, yet thousands of pounds of seed of this character are being sold every year, and many lots of even lower grades.

*Germination.*—There is probably no factor in crop production of more importance than the vitality of the seed sown. At the same time it is equally true that there is no factor more frequently overlooked. If the seed is not of good strong vitality the resulting crop is certain to be a failure. Look, if you please at samples Number 6 and 7 in Chart I; the former germinated 68 per cent. and the latter 71.5 per cent. With the low percentage of purity and germination the actual value of the former is 52.4 per cent. and of the latter 45.9 per cent. (the percentage of purity multiplied by the percentage of germination). Either of these would result in a failure to get a stand, even under favorable conditions. Sample Number 3 which has a purity of 93.9 per cent. germination only 80.5 per cent., meaning an actual value of only 75.6 per cent.; i. e., when seeding at the rate of twelve pounds per acre, only nine pounds of germinable seed would be applied. As an extreme case compare sample number 3 in Chart III which shows 21.8 per cent. of pure seed which germinated 81.5 per cent., giving the sample an actual value of 17.8 per cent. And still more extreme is the sample of alfalfa shown in Chart III, column 6 which contained 23.5 per cent. of pure seed

and germinated only 27 per cent., having thus an actual value of 6.3 per cent.

*Cost of Seed.*—The cost of the seed is, or should be, only of secondary importance. The first consideration should be the quality of the seed itself. Presumably the cost of the seed is regulated according to the quality, but this is not necessarily true. If the dealer is known to be thoroughly reliable, a fairly safe rule to follow is to buy what he calls his best grade. This is, however, not always a safe guide.

In the charts given herewith is shown the price paid per bushel for the different lots of seed and likewise the actual cost per bushel of the pure seed which will grow. It is the latter factor which determines the value of the different grades of seed. This, however, does not take into consideration the number and kinds of weed seeds present, which should always be reckoned with. Samples Numbers 3 and 4 were each sold at $8 per bushel. The percentage of pure seed was slightly higher in Number 4 than in Number 3, but the germination of the former was approximately 10 per cent. lower than the latter, making the actual cost of Number 3 $9.45 per bushel and of Number 4 $10.58 per bushel. Moreover, sample Number 3 contained less weed seeds, both in number of kinds and number of seeds and is therefore much the best grade to buy. The same is practically true of Numbers 5 and 6—seed sold at $7.50 per bushel. It will be observed that the actual cost of Number 5 is less than any shown in Chart I, but owing to the large number of weed seeds such seed should not be purchased.

## ADULTERATED SEED.

The adulteration of seed is not uncommon in the trade, and it is quite necessary that the farmers should learn to what extent this adulteration is being carried on. Of recent years unscrupulous dealers have placed large quantities of seed on the market which has been mixed with other seeds very similar in appearance but much less valuable. Red clover and alfalfa, particularly alfalfa, lend themselves very readily to the adulteration with yellow trefoil or black medick (*Medicago lupulina*). This is grown in Europe to a limited extent where it is used principally as a sheep pasture. It is found growing as a feed in many sections of the United States. Its use, however, as a forage plant, where alfalfa or clover can be grown is not worthy of consideration. Large quantities of this seed are imported into the United States at a cost of about five cents per pound, and when mixed with alfalfa command a price of from fifteen to twenty cents per pound. In addition to the use of trefoil as an adulterant for alfalfa, two species of bur clover (*Medicago denticulata* and *Medicago arabica*), and occasionally sweet clover (*Melilotus spp.*) are sometimes used illegitimately in this way. Alfalfa is seldom adulterated more than 50 per cent., but a few cases have come to our notice where the pure trefoil has been sold as high-grade alfalfa. The extent to which this mixing is done is shown in the tabulated results given in Chart II.

Chart II.—Analyses of samples of seed sold as alfalfa. Adulterated seed.

| | 1 | 2 | 3 |
|---|---|---|---|
| Broken seed, dirt, etc., per cent., | 13.4 | 15.4 | 4.4 |
| Seeds not alfalfa, | 12.5 | 19.3 | 46.1 |
| Adulterants, per cent., | 10 | 16.5 | 45.7 |
| Pure alfalfa seed, per cent., | 74.1 | 65.3 | 49.5 |
| Germination, per cent., | 50 | 43.5 | 95 |
| Price paid per bushel, | $12 00 | $6 00 | $9 60 |
| Actual cost per bushel of pure seed which would grow, | 32 40 | 21 12 | 20 40 |

The three samples in the table show an adulteration of 10 per cent., 16.5 per cent. and 45.7 per cent. respectively. In addition to the adulterants lots 1 and 2 contain a relatively high percentage of broken seed, dirt, etc. Moreover, the germination of the pure alfalfa seed contained in these two samples is so low (50 per cent. and 43.5 per cent.) as to render them almost worthless. The high percentage of dirt and the low vitality of the alfalfa seed is made possible owing to the nature of the adulterant. The trefoil seed is of a slightly brighter green color and when mixed with low grade alfalfa gives the seed a good appearance. When mixed with good clean alfalfa seed, the mixture would be considered as an exceptionally fine grade of alfalfa seed to one not able to distinguish the two kinds.

The first sample was sold at $12 per bushel, twenty cents per pound, which should buy the very best seed on the market. The actual cost of the alfalfa seed which would grow contained in this lot of seed was $32.40 per bushel. The actual value of the sample was 37.2 per cent.—which could possibly result in nothing other than a failure to secure a stand. This is likewise true of the other two lots of seed.

Kentucky bluegrass and orchard grass are also very commonly adulterated. The Kentucky bluegrass is adulterated with Canada bluegrass for which purpose approximately 700,000 pounds are imported annually into the United States from Canada at a cost of about one-half that of Kentucky bluegrass. The difficulty to distinguish the seed of these two grasses is very great and large amounts are sold as Kentucky bluegrass which contain no Kentucky bluegrass at all.

Orchard grass is largely adulterated with meadow-fescue and English rye grass. Of 265 samples of orchard grass obtained in the open market last year, 133 were found to be adulterated, the degree of adulteration varying from 1.1 per cent. to 98.55 per cent.

Further information relative to the adulteration of seeds can be had by consulting circulars numbers 12, 14, 15 and 18, published from the office of the Secretary, U. S. Department of Agriculture. These circulars give the names and addresses of seed firms who sold adulterated red clover, alfalfa, Kentucky bluegrass and orchard grass seed during the past eighteen months.

IMPORTED SEED.

Aside from the importation of large quantities of trefoil and Canada bluegrass which are used principally as adulterants, hun-

dreds of thousands of pounds of low grade alfalfa and red clover seed are brought into the United States every year from Europe. It must not be understood that all of the red clover and alfalfa seed imported into the United States is of poor quality for much of it is high grade seed. The importation of the low grade seed, however, should be discontinued and this can be best accomplished by our farmers refusing to buy seed of this kind. The tabulated results of a few importations of alfalfa and red clover are here given in Chart III:

Chart III.—Analyses of samples of imported red clover and alfalfa seed.

| | Red Clover. | | | Alfalfa. | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Amount of importations, pounds, | 30,550 | 6,740 | 9,300 | 88,185 | 12,106 | 12,540 |
| Total value, | $3,156 | $349 | $570 | $9,650 | $980 | ..... |
| Pure seed, per cent., | 95.5 | 48 | 21.8 | 97.5 | 96.2 | 23.5 |
| Germination, per cent., | 92 | 35.5 | 81.5 | 89 | 28 | 27 |
| Number of weed seeds per pound, | 4,627 | 139,727 | ..... | 454 | 816 | 17.190 |
| Price paid per bushel, | $6 18 | $3 10 | $3 68 | $6 54 | $4 86 | * |
| Actual cost per bushel of the good seed which would grow, | 7 04 | 18 17 | 20 70 | 7 53 | 18 05 | †6.3 |

*Actual value of the sample based on purity and germination.
†Per cent.

The chart shows one consignment of red clover consisting of 30,550 pounds, which was of fair quality, but the other two consignments which aggregate 16,040 pounds, were both of very poor quality. The actual value of Number 2 being 17.04 per cent. and that of Number 3 being 17.8 per cent. The conditions with the alfalfa are even worse. The actual value of the consignment of seed shown in column 6 was only 6.3 per cent. This same seed also contained 17,190 weed seeds for every pound, 4,754 of which were seeds of the clover dodder, the most dangerous weed for the clover and alfalfa field.

One consignment of 48,000 pounds of particularly low grade alfalfa seed was received at New York little more than one year ago which was imported for one cent per pound (sixty cents per bushel). This lot consisted of immature, brown dead seed—all of which was undoubtedly used for grading down good seed, as is all of the low grade seed which is imported. Some dealers frequently contend that consignments of seed of this character are recleaned, and that only the good seed gets into the market, the screenings being discarded. The most superficial examination, however, will show that this is far from the truth. The good recleaned seed in consignments, Numbers 2 and 3 of the chart cost $18.17 and $20.70 per bushel respectively. Would any sane man import clover seed at those prices, when as is shown in column 1 of the same chart he could have obtained a good grade of seed for $7.04 per bushel?

## HOW TO AVOID POOR SEED,

I am convinced that those of you who have followed what has been said, are almost of the opinion that the American seed trade

is deserving of but little respect. In view of this I desire to say, and with considerable emphasis, that our American farmers get from the seedsmen about the quality of the seed they deserve. The demand everywhere is cheap seed and it is about time that our farmers were beginning to wake up on the seed proposition and instead of demanding cheap seeds, to demand good seed of high purity, strong vitality and free from noxious weeds.

If you desire seed of good quality, secure samples from your seedsman and send them to your Agricultural Experiment Station and have them examined. But first of all avoid the cheap grades for cheap seed necessarily means seed of low vitality, a large percentage of screenings, innumerable weed seeds. and the officials of your Experiment Station cannot afford to examine samples of this kind. Demand of your seedsman good clean seed of high vitality, and with the assistance of the Director of your Agricultural Experiment Station, you will get it.

SEED LEGISLAION.

Unless our farmers soon begin to realize the importance of sowing only high grade seed, the time is not far distant when some legislation will be necessary to prevent the sale of adulterated and low grade seed. Europe has had Seed Control for a number of years and the dealers must guarantee purity and germination It is this European Seed Control which is largely responsible for the heavy importations of screenings and low grade seed into the United States. Similarly the recent enactment of a very rigid seed law in Canada has had a like effect. Our choice seed is exported to Canada and to Europe and the screenings from this choice seed are retained for our own sowings. Moreover, the screenings from the Canadian and European seeds are sent into the United States because they cannot use them at home, while they find a ready market for them here. It is to be hoped that our farmers will take this matter into their own hands and avoid legislation by persistently demanding a high grade seed. However, if legislation regulating the sale of agricultural seeds is undertaken it must of necessity be severe in order to be effective. Some of our states already have seed laws in which it is necessary to prove the intention of fraud, which is almost wholly impossible. The only effective seed laws must be such that any dealer selling or offering for sale seed of a quality other than that which is permissible under the law shall be subject to a fine or imprisonment or both. There is no reason why the seedsman should not know within certain bounds the quality of the goods he offers for sale just as much as the man who sells fertilizers.

A Member: If I should send you a sample for examination how soon would you send it back?

PROF. DUVEL: We try in our work at Washington to accommodate the farmer. If you tell us that you are in a particular hurry for it, we examine it and send out the answer by telegraph at your expense, of course. For a detailed examination it would take on an average sample—it might take three or four hours to work it out. Sometimes samples have to say in our laboratory a week before we can get to them.

MR. DAVIS: I know of samples that were sent to our experiment station at State College, and we didn't get an answer for six months.

PROF. DUVEL: I know that your facilities are limited at State College.

MR. CRAWFORD: I have got prices on goods now. Can you tell me which is the best? Is there any way to determine that?

PROF. DUVEL: So far as the trade names are concerned, they mean absolutely nothing, but there is quite a difference in the prices; it is a way they have of grading them. But to say they tell absolutely nothing, it is probably putting it a little too strong. Personally I think a seedsman that is in the business, if he makes up his mind that he is going to sell only a good quality of seeds, sell only the very best, he is going to build up his trade.

PROF. BUTZ: Mr. Chairman, I would like to say that I do not know of any sample of seed that has been lying at State College for six months, and they all would have to come to me if they had come there for a test. I want to say that arrangements have been made for tests whenever asked for. A germination test requires about ten days in order to complete the test, but if it is specified that they simply want to know the quality of the seed it will take but a very short time. I would like to know from Brother Davis where that seed was sent from; perhaps he would prefer to tell me privately.

MR. DAVIS: Mr. Chairman, I would say to Dr. Butz that maybe I am mistaken, but as I understood it, the man sent up a sample, and then wrote again and got a reply, and it took some six months.

MR. HOWDEN: Mr. Chairman, I would like to ask the Professor if the farmer couldn't do some of this work himself.

PROF. DUVEL: Yes, certainly he could. I took a quantity of these seeds, twenty-five in each lot, I counted that many out very readily and in about ten days one of the lots germinated strong; the leaves looked dark and healthy, while the others would hardly germinate; the lowest priced seed was the one that did not germinate. I very readily tested them and I took the other seed at half a dollar higher. Now you can determine with a strong microscope just how they appear.

The farmer can test them for weed seeds very well; he has to have a little magnifying glass. The way we do to make an examination, we take ordinarily about five grammes, that makes probably a teaspoonful or something like that. We then take a number of checks that these represent, showing the quality of the samples, and we simply put them down on a piece of white paper and go at them with a pair of forceps, and then these three different parts are weighed. A farmer can do that himself, or any man can do that and get a very good idea. Separate those which had the good clover seed and get those out by themselves, and then the weed seeds, and get the two piles together and estimate the amounts. Of course it is quite an important factor in that case to know these

different kinds of weeds. They may be common fox-tail or fall grass. I got a sample last winter that contained over fifty per cent. of fox-tail, and fall grass that was brought to me as good quality of seed. The farmer who grew it of course thought it was good.

As for the germination test, the farmer can do that just as well as we can do it at the experiment station and it is just as satisfactory. It does not take any very special apparatus, either. Take simply two dinner plates and a strip of canton flannel about that long (indicating) and moisten that canton flannel thoroughly and squeeze it out so that it does not drip and put down two thicknesses of it at the bottom of the plate and upon that we put our seed. Now there is one thing which I would mention as a precaution; never make a germination test without knowing exactly how many seeds you put in. If you do, you don't know in such a case whether ten per cent. germinate, or whether you have ninety-nine per cent.

A Member: If I find that by examination under the magnifying glass, would it be absolutely necessary for me to know the botanical names of these weeds?

PROF. DUVEL: No, it would not; you would take it for granted that they were bad seeds anyhow.

The CHAIR: The next subject on the program is, "Domestic Science, or Farm Homes," which was to have been presented to us by Mrs. T. E. Orr, of Beaver, Pa., but on account of her illness we shall be obliged to dispense with that topic, and we will pass on to the next number on the program, No. 3, which is entitled "Accumulation of Soil Nitrogen." We shall have the pleasure of listening to Prof. J. W. Harshberger of the University of Pennsylvania who will now address us upon that topic. It gives me pleasure to introduce to you Prof. Harshberger.

PROF. HARSHBERGER: Mr. Chairman, and Ladies and Gentlemen: I have been asked to speak on the accumulation of soil nitrogen. Before speaking on that subject, I would like to say a few words about how the nitrogen is lost from the soil. Perhaps the most important way is the drainage from the upper layers of the soil down into the lower layers, down into the sub-soil. Now this takes place more rapidly in autumn and in the winter months. The nitrogen is lost and the other ingredients are lost more or less rapidly during the summer and winter months.

Now it is very important to grow a catch crop, some crop that will hold that soil nitrogen.

Prof. Harshberger then read the following paper:

## THE ACCUMULATION OF SOIL NITROGEN.

By PROF. J. W. HARSHBERGER, *University of Pennsylvania, Philadelphia.*

It is important before considering the accumulation of soil nitrogen, to briefly state how the soil may lose this valuable chemical substance. The nitrogen in the form of ammonia gas may be diffused

into the atmosphere, and there is no doubt, but that a very considerable amount of nitrogen is thus dissipated. The soluble nitrites and nitrates may be removed from the surface layers of the soil by drainage into the subsoil, where they usually find their way by the percolation of rain water from above. This loss by drainage is greatest during the late summer and autumn, when the process of nitrification is excessive, and hence, it is important to grow some crop which will catch this nitrogen. Here, we have the explanation why Indian corn does not exhaust the soil, as rapidly, as some other crops. The growth of corn extending much further into the late summer and autumn, the plant is adapted to utilize the nitrates formed by the active processes of nitrification. In the third place, under certain conditions of soil, the nitrogen may be united chemically so as to form insoluble compounds, and thus, the available nitrogen is locked up in some unavailable form, or by the process of denitrification, the nitrogen may be set free upon the decay of dead plants and animals that are found in any given soil, and thus lost to the growing crop. Perhaps, the largest amount of nitrogen is removed from the soil in the harvesting and disposal of growing crops. These crops are in general sold at our large centers of population, or are exported to foreign countries, where, they are lost, in the form of manurial wealth to the country in which they are produced. In the husbanding of our natural resources, the sewage from our large cities, which is poured into the rivers and ultimately finds its way to the sea should be pumped into reservoirs where, by a proper system of distribution, it can be delivered to the fields, where it is most needed. Connected with this sewage disposal is the encouragement of home industries and local markets, where the produce of our farms might be utilized directly without the expensive outlay necessary to export such products to foreign lands.

Having briefly outlined the ways in which the soil becomes impoverished, it is important clearly to state how the nitrogen of the soil may be accumulated. One of the most important sources of supply is barnyard manure, which contains large quantities of ammonia, but that ammonia cannot be absorbed directly by the root hairs of the plant. We have abundant experimental proof that green plants, except the leguminosae, can utilize the nitrogen only in the form of nitrates, or only to a very slight extent, as ammoniates. The ammonia in the manure must be converted into the higher form. It has been found that there are two steps in this conversion through the activity of soil bacteria. One kind of bacterium converts the ammonia into nitrous acid, or nitrites, the other organism transforms the nitrous acid (nitrites) into nitric acid, or the salts of nitric acid, the nitrates. The growth of these organisms in the soil is stimulated by aeration, by the requisite moisture and by a feebly alkaline condition of the soil. Too much organic material, too much water and too acid a condition of the soil, inhibits the growth of the micro-organisms concerned in nitrification. Once the ammonia is converted into nitrates, the supplies of nitrogen in the soil become available to green plants. The root hairs of all our crops take up the nitrates in the soluble form, and in the green parts, they are converted into protoplasm, or by protoplasmic activity stored as nitrogenous reserve food. Many plants are inde-

pendent of this supply of nitrogen, viz: the leguminosae, and can utilize directly free atmospheric nitrogen.

We have, therefore, two classes of agricultural plants: Nitrogen Consuming Plants and Nitrogen Storing Plants. The nitrogen consuming plants can utilize the nitrogen only in one form and that is as nitrates. There are four groups of these nitrogen consuming plants, viz: root crops, which include the potato, sweet potato, raddish, turnip, beet, mangold wurzel, horse raddish and onion; leaf crops, viz: kale, celery, lettuce, cabbage, salad plants in general; fruit crops which comprise apples, pears, quinces, strawberries, cherries, peaches, etc., and lastly the cereals, such as wheat, rye, barley, oat, millet, maize and various other grasses grown for hay. All of these enumerated crops need nitrogenous supplies for their best development, because sugar, starch and other carbohydrates reserve materials are only stored in the plant in considerable quantities when nitrogen is present in efficient supplies. The proper storage of the various carbohydrates can take place only when the storage cells are supplied with the requisite amounts of nitrogen and potash. If the plant is nitrogen hungry, such carbohydrate supplies are not usually reserved.

The second group of agricultural plants, the nitrogen storing, comprise those plants that belong to the natural order leguminosae. These plants, if the soil is rich in nitrogen, or if nodules do not form on their roots, act as ordinary nitrogen consuming plants, i, e., they require nitrogen, but in ordinary soils, the tubercle forming bacteria are in sufficient numbers to cause the production of nodular swellings on their roots. When the seeds of clover, or some other leguminous species are planted, soon after the primary roots appears with its root hairs, the nodule producing organism Rhizobium leguminosarum, attracted perhaps chemotactically to the fine root hairs, pentrates the wall of these root hairs by ferment action and enters through these cells into the middle cortex layers of the root. So many organisms enter at once, that they form a long slimy cord, almost hyphae like. Here in the root cortex cells, the micro-organisms form nests, or pockets, that become filled with bacteria. The presence of these rod-shaped bacteria causes the formation of swellings, tubercles or nodules on the roots of the leguminous plants. Here they remain, utilizing the free atmospheric nitrogen until about the time of flowering, when the germ cells begin to undergo involution changes, enlarging considerably in size and assuming S-shaped or Y-shaped forms. After this, they are gradually absorbed by the green plants as protoplasmic and nitrogenous substance and this substance is conveyed to the actively growing points, or stored as nitrogenous reserve supplies. The growth of these useful organisms in the soil is stimulated by aeration, by a considerable amount of organic material, by proper soil drainage, so as to prevent the accumulation of water and liming, so as to overcome soil acidity.

When the leguminous crop is mature, or before it is mature, it may be plowed under as a green manure. Here by the process of putrefaction, the organic nitrogen of the living plant is converted into a form of nitrogen which through the agency of the nitrifying organisms is again converted into a form available to the growing green plant. Thus the nitrogen cycle is completed. Or, if the leguminous crop is consumed, it should be used on the farm and not

sold off the farm, because as barnyard manure, the plant substance can be restored to the soil, and only as much nitrogen is lost theoretically, as is removed in the animal tissues. One of the most approved methods of agricultural practice is to grow leguminous crops for home consumption and afterward nitrogen consuming crops for sale. One practical farmer grows mixed crops of leguminous plants, liberally fertilized with potash and phosphoric acid. He converts the first year's crop into silage, which he feeds to his cattle, returning the manure to his soil and converts the second year's produce into hay. The land thus produces highly nitrogenous crops without manure and is left in a high condition for potatoes, or cereal crops, which respond to dressings of nitrogenous fertilizers.

Having ascertained these facts, the question naturally arises? How can the growth of leguminous plants be encouraged? It has been discovered, that leguminous crops require considerable supplies of potash and phosphatic fertilizers. Potash has considerable to do with the metabolism concerned in the formation of carbohydrates and phosphorus compounds with the nitrogenous metabolism. The writer was impressed by this fact in 1892 on a visit to the Rothamsted Experiment Farm in England. Whenever nitrogenous fertilizers were supplied, there was a natural appearance of grasses on the plots thus treated. Whenever potash replaced the nitrogen, the grasses diminished and leguminous plants occupied the ground.

From what has preceded, it becomes necessary to study the nodule producing bacteria. Can these be added to the soil, or used so as to increase the number of root nodules per plant? This has been accomplished by the methods of pure culture. Pure cultures of the various races of Rhizobium leguminosarum have been grown and these have been introduced into the soil directly, or on the surface of seeds previously dipped in the liquid-culture media. The United States Department of Agriculture distributes these germs on cotton previously soaked in the liquid culture media, but this method being open to certain objection, culture tubes of pure germ growths are now being largely used.

The following precautions should be observed in using the pure cultures of the nitrifying organisms. Inoculation of the soil is desirable, if it is low in organic matter and has not previously borne leguminous crops, or if the legumes previously grown on the same land have been devoid of nodules, or if the legume to be sown belongs to a species not closely related to one previously grown on the same soil. For in order to prevent clover sickness, it is advisable to grow in succession a variety of leguminous crops. Inoculation will prove useless, if the legumes usually grown are producing average yields, or, if the roots show nodules in abundance. If the soil is rich in nitrogen, it is useless to inoculate the soil for few nodules are formed under these conditions. Inoculation will be a failure, if the directions are not carefully followed, or if the soil is acid and in need of lime. In most cases failure will result, if the soil needs fertilizers, such as potash, phosphoric acid or lime. In all cases, it should be remembered that soil inoculation will not overcome the results of bad agricultural practice.

MR. SEEDS: Mr. Chairman, I would like to ask the Professor a question. Professor, if I understand you right, I understood you

to say that of some leguminous plants, some may and some may not have nodules on.

PROF. HARSHBERGER: Yes.

MR. SEEDS: The ones without nodules on, are they any better to the farmer?

PROF. HARSHBERGER: No, the leguminous plants—it is only when the soil is deficient in nitrogen that these plants become nitrogen restorers.

QUESTION: The leguminous plant without the nodules on is no better than the others?

PROF. HARSHBERGER: No; one farmer may have a good catch of clover, and another not, and one may have the nodules on and the other not. You may get a catch of clover without the nitrogen.

QUESTION: Then there is no use of growing clover only that the man that has the nodules on the roots is ahead of the man who has nothing; if I understand you right, you say all soils have the bacterial germs more or less.

PROF. HARSHBERGER: Yes, as I understand, the soil that has been growing clover will have the red clover germ; there might be a difference in these different germs, for instance germs that will take on red clover will not take on alfalfa; it is all one germ as I understand it, but there are slight differences, so that one may accept that particular sort and grow white clover or crimson clover or alfalfa, even if the soil has only the crimson germ. Soil which contains only white clover—the nodules will not be formed on a red clover crop.

MR. SEEDS: Pennsylvania has been a great clover state and it ought to be inoculated thoroughly with the bacteria of the clover plant, but it is still getting harder to raise clover every year.

PROF. HARSHBERGER: The germs must have exhausted their vitality, as far as I know, like when a man has been working in one position for many years. You know he needs a change after a while —a summer vacation now and then. These bacteria are exactly like higher organisms in a certain way, I am inclined to think.

The DEPUTY SECRETARY: Mr. Chairman, I would like to ask the Professor, in case the potash should be exhausted in the soil, would that have any effect

PROF. HARSHBERGER: I think so, yes, sir.

MR. DRAKE: Professor, if I have a field that is rich in nitrogen, if I supply the bacteria by the patent process, will they produce nodules?

PROF. HARSHBERGER: I think if you observe the precautions that are recommended, that result will follow, in soil not water-logged, good, mellow soil containing the potash and other

matter required. If you have a soil that is already rich in nitrogen, you don't want them then.

In Germany, near Berlin—Berlin is situated in a very sandy district—the only thing they can grow is pine trees in that neighborhood. They grow the yellow lupine. After the growth of the lupine, it becomes very much richer in nitrogen.

MR. NELSON: Mr. Chairman, I would like to ask the Professor if the presence of potash in the soil is one of the principal things in the growth of clover, that when we burn and clear new land in this country, why it is that we have a condition there in which clover will not catch on, or germinate, except in rare spots.

PROF. HARSHBERGER: I think that is due to the leaf mould that is still present in the soil.

MR. NELSON: That is burned out by burning your clearing.

PROF. HARSHBERGER: If you had a forest fully cleared, you would find that leaf mould still present. It will go down a foot or a foot and a half into the soil, and burning over the top of the soil, would not burn that out. You would perhaps burn the loose material whereas this compact, black earth would go down a foot or two.

MR. NELSON: That would hold good in swampy land, but not in the conditions that I speak of. In our ordinary lands we don't have any leaf mould, down more than three inches, that is, where the ordinary burning has been done.

PROF. HARSHBERGER: I would explain that in that case, by saying that through all the ages, the organisms that exist, that are in the soil of the forests, are more of the denitrifying kind; they break down the leaf mould, and they are in larger number, and it takes some time for the germs that may be present to increase themselves in sufficient number to do that.

QUESTION. Might they not be destroyed by heat?

PROF. HARSHBERGER: Yes; I am very glad for that suggestion.

PROF. WATTS: Mr. Chairman, I would like to say that I remember a case not very far away, I remember that they sowed clover on a certain field and all that field was limed except a square block in the center of the field, and the clover was a perfect success except in the center where there was no lime applied, where it was a failure.

MR. NELSON: It is almost impossible in this country to get a right good catch of clover before the third crop after land is newly cleared, and I don't understand why unless it be the aeration by cultivation, wherein the exhaustion of the acidity would come in.

PROF. HARSHBERGER: Don't you apply lime to your soil?

MR. NELSON: It is not generally applied to new land. I don't know of any instance where we have applied lime to new land. I

wanted to ask you if the process of extracting nitrate from the air was likely to prove a success. You know we have several plants for that purpose at present.

PROF. HARSHBERGER: I don't quite understand.

MR. NELSON: The process of extracting nitrates from the air—is it likely to prove a success commercially?

PROF. HARSHBERGER: I can't answer that question, I have not followed the details of that.

MR. NELSON: You know they have a plant in Norway and there are one or two more in the process of erection for that purpose; it seems that their greatest difficulty is in the storage.

MR. HALLOWELL: When I first started farming, I remember there was an old machine out in the loft and I didn't know what it was, and the landlord was there one day and I asked him what it was, and he said, "Why don't you know what that is? That is a clover huller." When I look back to my boyhood days and think about the methods of farming then, and since I have seen this chart and seen how we have been deceived on seed, I have come to the conclusion that that has a good deal to do with our catch of clover. Our seed has been adulterated, and adulterated so that probably we sow more seed that don't grow than that that does.

A Member: Mr. Chairman, in my locality an application of wood ashes where there has been no clover sown for perhaps five years or more, will almost invariably bring in a good field of clover.

PROF. HARSHBERGER: I think that would naturally follow the application of potash in almost any form.

MR. NELSON: I have noticed a peculiar phenomenon. Being interested in bees, I got some bacteria with sweet clover seed several years ago and I find it is indigenous to this country; if it is sowed, it will grow in a square block or in little patches, and yet in soil down at a certain tunnel, I find that these seeds will germinate and grow in disintegrated rock, and I wonder why.

PROF. HARSHBERGER: I don't know why.

MR. BOND: Out in my neighborhood, there is some sweet clover growing wild and there is something very peculiar about it. I have been trying to cultivate it without success. It grows under the most unfavorable conditions very luxuriantly. I had some photographs taken for my friend Seeds, where it grows right on top of the cupola of an old blast furnace. I counted there from a single seed stool, thirteen stems averaging from five to eight feet high; it is growing with a growth of from five to eight feet right on the center of the slag bank where there is nothing but the slag of that furnace for twelve feet deep and yet it refuses to grow under favorable conditions.

MR. SEEDS: I have been growing that on my farm and I have got some seed from it and I am going to sow it again.

MR. HALL: Mr. Chairman, I would like to ask the Professor whether weather conditions have anything to do with the successful growing of such crops.

PROF. HARSHBERGER: I should think so, if you have a heavy rain or a dry period, I should think it would have a very material effect.

MR. HALL: Will you please give us the ideal condition of the soil?

PROF. HARSHBERGER: The conditions as I understand them are—the soil should never be acid; that can be decided by a litmus test; in the second place, the soil should not, as I said before, have a water-logged condition. The water should have drained through; there should be a certain amount of moisture, of course, but it should have been drained through into the subsoil, and there should be a certain amount of aeration, and also a certain amount of humus. Humus is not absolutely necessary, but there should be a certain amount of that in the soil, and there also should be a certain amount of lime. Those are the conditions, as I understand them, for inducing the production of the nodules on the roots.

MR. SEEDS: The farmers over Pennsylvania don't know whether they are a success until they dig up the roots and make an investigation.

PROF. HARSHBERGER: Well, they don't need to dig up the whole crop, I guess.

MR HALL: I made some experiments in inoculating a field that would not grow clover with soil from a field that did grow clover; a part of it was a success and a part of it was a failure. A part of that land was put in on a cloudy day, and harrowed in, and a part of it was put in on a sunshiny day; now which of those days should have been successful?

PROF. HARSHBERGER: I think both of them should have been; I cannot see why there should have been any difference.

MR. HALL: There was a difference; that put in on the sunshiny day, I couldn't get any clover.

PROF. HARSHBERGER: It is possible that the sun may have dried it off perhaps so as to have killed the germs.

MR. SEEDS: I have been raising some alfalfa and it has not been a question with me in regard to nodules; I don't care anything about the nodules only so that I get the hay. I have a field situated between the house and the barn that has been sown to alfalfa this year. I don't care anything about the nodules, but I am going to plant that alfalfa—I am going to seed it the third time. My object is to plow down the alfalfa plants and get into that soil the food that produces alfalfa and see if I can raise as much as the western man.

PROF. HARSHBERGER: The mechanical condition of your soil is what you regard, probably.

MR. SEEDS: The question is whether I can be as successful without the nodules. When I get my roots down into the ground ten or fifteen feet, I believe I shall succeed.

PROF. HARSHBERGER: I should think it probable that you want soil accumulation in your soil.

MR. ORR: Mr. Chairman, I wish to announce that the Committee on Resolutions will meet to-morrow morning at eight o'clock in the hotel dining-room, and if anyone has any resolutions that they wish to present to the committee, he will please present them before that time.

MR. SEXTON: I will make the announcement now that the opening of the session to-morrow morning will take place at nine o'clock.

MR. McCLELLAN: Mr. Chairman, I would suggest that we meet at the hour appointed and not meet half or three-quarters of an hour later, as we did to-night.

The DEPUTY SECRETARY: I would say to the delegates present, do not forget the hour of meeting—nine o'clock in the morning; let us all be here promptly at that hour.

On motion, duly seconded, the meeting adjourned to nine o'clock to-morrow morning.

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Court House, Clearfield, Pa.,
May 30, 1906, Wednesday, 9 A. M.

Chairman of the morning session, J. S. Burns.

MR. BURNS: Ladies and Gentlemen: The hour for opening this morning's meeting has already passed a few minutes, and it is our purpose to begin as early as possible, in order to keep pace with the requirements of the program. Now we wish that each of you be provided with the slips, so that you will be enabled to write upon these any questions which you may desire to ask upon these subjects. Especially we would ask you to do so on the part of Prof. Massey, whose hearing is a little defective, and also for Prof. Owens; we think it is the better plan, anyway. The first topic upon the program this morning, is entitled, "What Chemistry is Doing for the Farm," by Professor William G. Owens, Bucknell University, Lewisburg, Pa.

I now take pleasure in introducing to you Professor William G. Owens, who will now address you upon the subject named.

Prof. Owen's address is as follows:

## WHAT CHEMISTRY IS DOING FOR THE FARM.

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By PROF. WM. G. OWENS, *Bucknell University, Lewisburg, Pa.*

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When we speak of farming and agricultural chemistry, we mention the oldest and one of the youngest sciences. The first began

in a crude way with the beginning of the human race, the second with the investigations of Liebig, just two-thirds of a century ago.

Some may question whether farming is a science. But if it is not, one of the principal objects of the agricultural chemist is to put it on a scientific basis. When Liebig, the father of agricultural chemistry, began his investigations sixty-six years ago, on the subject of nutrition, almost nothing was known upon this subject. At first the progress was slow and few followed this line of chemical research. Other fields offered so much larger returns in a material way for the time and money expended, that this work was taken up by few. Work done along this line would affect tens of thousands of farmers, and produce millions of money in the country at large, yet the share of profit coming to each individual is comparatively insignificant. A few more bushels of grain raised on each farm is worth millions of dollars to the nation, but only a few dollars to each farmer, therefore comparatively little was done in agricultural chemistry until the Government took up the subject, and now no government worthy of the name exists that does not carry on investigations in agricultural chemistry.

In speaking upon "What Chemistry is Doing for the Farm," note first that it is trying to discover what is needed by the plant and animal for its highest and quickest development. To do this, the chemist has analyzed every part of plant and animal, and found out the elements and compounds which compose them. He has next tried to learn in what form the elements must be supplied to the growing body to produce the best results. He has then ransacked all nature and the products made by man to find the proper materials capable of furnishing the nutriment needed.

In plant nutrition he has discovered that the only elements not furnished in abundance by most soils, are potash, nitrogen and phosphorus, but these are absolutely essential and no plant can make a proper development if either of them is wanting. They must also be in an available form; tons of them would be useless if the plant could not use them. On the other hand, they must not be in too great excess, or they will be lost by leaching out of the soil even if they do not kill the plant by their chemical action. A nice equilibrium must be maintained between demand and supply.

### POTASH.

When the demand for potash was limited, it could be supplied by wood ashes, but as that supply became exhausted, the chemists of Germany put the great mines of Stassfurth on a paying basis and now the larger part of the world's supply is obtained there.

### NITROGEN.

When it was discovered that nitrogen was used by plants and that the most available form was the nitrate, the deposits of guano off the coasts of South America were developed. When this source became exhausted, the nitrate of soda beds of Chili and Peru were opened up. As the price kept advancing, various forms of animals matters were utilized. Fish which were not edible and offal from slaughter houses were turned into fertilizers, furnishing nitrogen, thus using materials which a few years before had no value, and

were an expense to the producer. Not content to produce nitrogenous compounds which had already entered the animal kingdom, the chemist discovered the means of calling to his aid innumerable bacteria which have the power of fixing the free nitrogen from the atmosphere. But with all this the chemist was not content, and he has kept on experimenting until to-day it is reported that in Europe and America there are factories in successful operation fixing the free nitrogen of the atmosphere and making it available for plant growth. If this has really been accomplished, and the chemist has succeeded in transforming the nitrogen of the air into a compound available for plant food and at a slight cost, a new era in farming has arrived.

### PHOSPHORIC ACID.

When phosphorus was needed for the growth of plants, bones were first used; later they were treated with acid to make them quickly available.

Phosphate rocks were next utilized, and after that certain linings of steel furnaces. Thus we see that the chemist has placed the principal inorganic fertilizers in the hands of the farmer.

Whenever he found products whether of nature's make or man's which contained the elements of fertility necessary for plant development, he devised a method of treatment which would make the food available for plant nutrition.

Knowing the value of the elements taken up by the plant enables the farmer to grow such crops as will exhaust the soil to the least degree, or if a crop which requires a large amount of a certain fertilizer is raised, that ingredient can be supplied in the greatest abundance.

The study of plant nutrition, which Liebig first investigated, has enabled the farmer to put on his fields just those compounds which will be of the most value to his crops.

The soil is not a dead mass as was once supposed, but is now known to be teeming with life and must be treated as such.

### FINDING VALUE.

Chemistry helps the farmer by determining the value of what he produces, uses and loses. In feeding stock it is of great importance for the farmer to know not only what can be used, but what has the greatest feeding and manurial value. It often happens that a farmer can gain by selling part of what he has raised and buying some cheaper feed. The compounds found in feeds of most value are protein, fat and carbo-hydrates. These vary greatly in different feeds as bran, middlings, brewers' grain, linseed meal, cotton-seed meal, etc., but if the feeder understands the value of each, he can so buy as to get the best results for the least money.

### NEW FEEDS.

Many new feeds have been placed at the disposal of the farmer through the work of chemistry. When cotton-seed was a nuisance to the man who produced it, and a nuisance to his neighbor as well as to the fish in the creek where it was usually thrown, the chemist took it, extracted the oil, which immediately became a valuable product, and produced from the cake a valuable cattle-feed and the

cheapest source of protein. The chemist has no small part to play in the marketing of many bi-products which but a few years ago were not only a drug on the market, but many of them had no value at all. By the methods now in vogue, there are few bi-products which cannot be utilized to feed either the animal or the soil.

### FEED VALUES.

The chemist has not only determined what elements are needed by the plant or animal for its best development, but he is trying to determine in what form and quantity they should be introduced to produce the best results. Much valuable food is wasted by improper use. Feeding standards have been made out for different animals, and by following these more or less closely, the farmer can get the highest value out of the materials at his command.

Not content with things as he finds them, the chemist has enabled the producer to improve his product. By the invention of the Babcock Milk Tester, the chemist at the Wisconsin Experiment Station has placed in the hands of every farmer, a means of testing the value of his cows. By proper selection and breeding it is possible to greatly improve a herd of cattle, and send the "boarders" to the butcher's block.

By analyzing the different parts of a grain of corn and noting its physical appearance, the chemist has enabled the grower in the great corn belt, to produce kinds of corn which differ widely in their chemical contents. One kind is used for growing cattle, another for starch or other purposes. Wheat has also been differentiated, and the raising of macaroni wheat has become a distinct business in some localities.

Secondly, the chemist does not only introduce the farmer to his best friends, the fertilizers and feeds, which help him produce the largest crops and best herds, but he also has tried to protect him from his enemies. Of these enemies there is first himself, often the farmer's greatest enemy is his own wastefulness. He does not know how to care for the manure produced on the farm and the chemist has shown him that almost a hundred million dollars' worth of fertility every year goes down the Mississippi River, and even this is only a fraction of what is annually lost in the whole country by the improper care of manure. Again, in the treatment of his stock, sometimes he over-feeds, and again he under-feeds.

### PROTECTION AFFORDED BY CHEMISTRY.

Chemistry protects the farmer from those who would impose upon him. Scarcely had the farmer begun to use fertilizers until all kinds of materials were sold to him as high grade goods. Before the days of the public chemist, carloads of pulverized sand were sold to unsophisticated farmers of Pennsylvania as deodorized Peruvian guano, but since the chemist began his work, all this has been changed. Now every progressive country in the world employs a number of chemists who devote their time to analyzing fertilizers and seeing that they agree with the formulae marked on the container.

Another gigantic fraud is the sale of artificial butter under the name of cow butter. While it is perfectly proper to sell oleo under

its proper name and mark, every one must agree that it should not be allowed to replace the product of the cow. Chemistry also protects the honest milkman from the man who buys old milk and preserves it in a like case. There are also many other kinds of adulterations which time does not permit me to mention.

The farmer has another class of enemies from whom the chemist tries to protect him. It is the insects which infest his trees, vegetables, seeds, etc., which must be killed. The scale and fungus growths must be combatted. For all of these the chemist has been trying to find a remedy and in most cases has succeeded if the cure is properly applied.

### THE REIGN OF LAW.

The highest service which chemistry is doing for the farm, is to make the farmer realize that he and the growth and development of all things on the farm, are under the reign of law. There is no such thing as chance or luck. Often when a man loses a crop or an animal, because he contravenes the laws of nature, he says he had bad luck, or lays it to Providence, but he must learn that his verdict is no more just than of the Texas coroner's jury who sat on the case of the cow-boy who committed suicide and who had many friends who thought suicide a disgrace. The cow-boy, after nearly killing himself with drink, took a half ounce of arsenic, swallowed an ounce of laudanum, opened his arteries with a razor, and sitting on the window sill, put a bullet through his heart and fell five stories to the flag-stones below, breaking his neck. The jury, out of respect, brought in the verdict, "Died by the intervention of Providence."

The farmer must realize that he is living in a world governed by law, and when he follows the law, all goes well, but when he follows his own ideas, that does not change the law. Luck and the moon, and all the other signs will be of no avail to the man who does not think. The lively discussion which followed the learned papers of Professors Duvel and Harshberger last night, show that in this audience there are many who have been thinking, and the greatest service that the chemist can do for the farmer, is to help him solve the problems which thinking will call forth.

A Member: Mr. Chairman, in our locality we have been feeding gluten meal and some farmers claim that it pays to sell their corn and buy the gluten meal. I would like to ask Prof. Owens what he thinks of that.

PROF. OWENS: That would depend entirely upon the price of the two; it is necessary for the dairy to keep supplied with a certain amount of protein and by working out that equation, it is possible to determine the question. You must take into account not only the value of the materials, but also take into account that certain feeds do not agree with meal when fed in excess, but leaving that out of the question, it is possible to determine exactly how much of any given compound ought to be fed to cattle to produce the best results. It would be impossible to say offhand whether it would be best to sell the corn and feed the gluten meal, or to feed the corn.

MR. HUTCHISON: Mr. Chairman, I would like to ask Prof. Owens if the gluten meal would not be a great deal higher in protein.

PROF. OWENS: Yes, if you wanted protein, then the gluten meal would be the material you would want to get; of course just what you want is the thing that requires consideration in determining what to use.

MR. PHILLIPS: Mr. Chairman, it seems to me that there is another question that comes in here; the gluten meal is a heavy, concentrated food, and cannot be fed in large quantities with impunity. I think it contains somewhere in the neighborhood of five per cent. of protein, and is the most successful food where that is needed.

I want to say this, that there are other food products not quite so high in protein, and yet very desirable as feeds, and in addition to what the Professor has said, as to the requirements of a certain number of pounds of protein that an animal ought to have in twenty-four hours, there is still another important question and a very important one too, and that is the question of health.

PROF. OWENS: Yes, you must always include in your standard the health of the animal, which would be more or less of an individual factor.

QUESTION: Is there positively nothing in the signs of the moon for planting crops?

PROF. OWENS: I think as long as you plant upon the earth, there is nothing in the signs of the moon.

MR. HUTCHISON: Hasn't the moon an effect upon the tides upon the earth?

PROF. OWENS: Yes, certainly it has.

MR. HUTCHISON: Might it not have some effect upon the earth as well as on the tides?

PROF. OWENS: I don't know that any effect has been discovered.

MR. HUTCHISON: Might it not be possible?

PROF. OWENS: I do not say it is absolutely impossible; there is more in nature than our philosophy includes.

MR. R. P. KESTER: What difference between commercial nitrate of soda and salt-petre?

PROF. OWENS: Nitrate of soda is sodium nitrate. Salt-petre is obtained largely from India and sodium nitrate is obtained largely from Chili. Potassium nitrate, if you could afford that, would furnish the two elements at the same time, would give you the nitrate and potash both, whereas the nitrate of soda only gives the one.

DR. FUNK: Which is the cheapest to use?

PROF. OWENS: I haven't figured that out. You could easily do that; any one can do that and arrive at the absolute amount of

potash you get. Take then your nitrate of potash and calculate the absolute amount, and after that the value of the nitrate that is in it; it would be possible to determine very easily and accurately what is in it. It is simply a matter of calculation.

DR. FUNK: The nitrate of soda will cost you about fifty-two and the other will cost you about seventy-five. Now which is the cheapest?

PROF. OWENS: I have not determined it; I have not figured it so am not prepared to say at the present time.

MR. FENSTERMAKER: Give some information about the process of extracting nitrogen from the air by electrical instruments.

PROF. OWENS: I don't know; I havn't seen any statement of the exact apparatus that is used. Prof. Harshberger, have you seen that?

PROF. HARSHBERGER: No, I don't know anything about that. The nitrogen can be obtained by passing a very powerful current through the air under certain conditions, but the processes, so far as I have seen, have not been published. I have not noticed them in any scientific journal, therefore more than that general statement I could not give.

MR. NELSON: I believe that the *American Inventor* described that process completely. I wish I had brought it along.

PROF. OWENS: I wish you had.

MR. MILLER: Has the chemist succeeded in putting all farmers to thinking, or what per cent?

PROF. OWENS: That is a question I would like to have answered myself. I am sure they are beginning to think, and farmers are waking up, and when the time comes that they properly appreciate the possibilities that are open to them, and when they utilize the materials that are lying all around them, there will be accomplished far better results. You have no idea of the amount of waste there is all around us, until you begin to think of it. Coming here from Williamsport yesterday, we came through certain sections of country where we saw the remnants of thousands of pieces of lumber that had been allowed to go to waste. You travel through Germany and go into the forests there, and you will find them almost as free from sticks as the streets and parks are here in the cities. After every storm the women go out and gather up these things, or the old men, or the children, so that nothing is wasted. Here you go out into these forests and millions of feet of lumber are allowed to go to waste.

MR. HUTCHISON: Would that not improve that soil from the farmers' standpoint.

PROF. OWENS: It may leave a little potash and that is about all. I only speak of that as one sample of the waste that goes on continually in this country, and the farmer fails to appreciate it; there are of course, many other wastes.

MR. DRAKE: I would like to ask a question relating to the subject of feeding. I am a cattle feeder, you may say, at least, I am feeding some cattle on pasture. Now the question I wish to ask is, Do I need to have a grain carrying a very heavy per cent. of protein?

PROF. OWENS: Are they cows or steers?

MR. DRAKE: Steers.

PROF. OWENS: Without looking up the matter, I should think that you would not need to carry very much protein in that case.

MR. DRAKE: Would you say that the pasture will supply enough? It is a good, blue-grass pasture.

PROF. OWENS: I should think it would supply nearly enough protein, but I would not like to be quoted as authority on that. You can get the Bulletin and see just exactly what is required. You must feed every animal for a certain purpose. In the case of the cow you are feeding for milk, and in the case of the steer, you are feeding it for fat, and so of course you must apply that doctrine to the compounding of the feed.

A Member: Is cottonseed meal dangerous to feed to cattle?

PROF. OWENS: Well, it is, unless you feed it in safe proportions; that is the cheapest form of protein that you can feed, but you must know what proportion is safe. I think that something like a pound and three-quarters, not over two pounds, would be about the amount; but as I say, I do not have these figures in my head; I would prefer that you would look them up in the Bulletin from those people who have carefully worked them out.

MR. BILLINGS: Does cottonseed loose value by age?

PROF. OWENS: Cottonseed of course, is a highly organized seed, and if not properly cared for, would loose value, and might present some danger if decomposition takes place in the cottonseed, but if properly taken care of, there would be probably but a small loss.

MR. HUTCHISON: Where feed is damp in a shed, it looses very rapidly; the protein is not likely to loose so much but you must be careful in keeping the feed in a proper and suitable place where you buy a ton or two, or you will loose a large percentage of the fat.

MR. BLYHOLDER: What effect or what change in the feeding value does the heating of corn have? In our section of the country there is quite a good deal of corn sold now by one certain merchant that heats on the cob. I would like to know what effect that has upon the feeding value?

PROF. OWENS: That lowers the fat; it don't affect the protein so much, but it lowers the fat.

MR. BLYHOLDER: What effect would it have?

MR. HUTCHISON: Well, the cattle don't like it.

QUESTION: After it has passed a certain stage, as I understand, it is positively dangerous to feed it.

PROF. OWENS: Yes.

QUESTION: I would like to ask a question in reference to sunflower seeds. How do sunflower seeds compare in feeding value with cottonseed?

PROF. OWENS: They have an abundance of fat, and also considerable protein, but I could not give you the comparison with cottonseed.

PROF. MASSEY: We had a perfect epidemic in North Carolina of scours in horses and it was traced to that very thing, the feeding of damaged, mouldy corn, and mouldy feed of any sort is likely to produce that effect.

PROF. OWENS: Of course in the case of any feed that is spoiled, mouldy hay or corn or anything, it should be avoided, because that is not a proper food; it has passed the condition when it is a proper food for the animal to eat, and if you use it you always run the risk of bringing on disease of one kind or another by using that kind of food.

The CHAIR: The time has arrived when we should take up the next subject. Now allow me to repeat what I said in the morning; Prof. Massey who will address you, his hearing is somewhat defective, and he has asked that those of you who wish to ask him questions, will please write your questions upon these query slips.

I now take pleasure in introducing to you Prof. Massey the editor of "The Practical Farmer." His subject is "Soil Improvement."

PROFESSOR MASSEY: Mr. Chairman, Ladies and Gentlemen: I thank you for the welcome to Pennsylvania. There was a time when we men wearing the gray clothes were welcomed rather warmly by the burning of powder, and they were rather careless in the use of their guns.

I would rather look my audience in the face and talk to them, but in this case, in order to keep myself in line, I have prepared a paper and I shall ask your indulgence while I read it, as the subject is one of recognized importance, and I want to say what I have to say as concisely as possible.

The paper of Prof. Massey is as follows:

## THE IMPROVEMENT OF THE SOIL AND THE MAINTENANCE OF FERTILITY.

By PROF. W. F. MASSEY, *Editor, "Practical Farmer," Philadelphia.*

There is no more important problem for the farmer in the older sections of the country than the improvement of the productive

character of his soil, and the maintenance, in an economical and business-like way of this productiveness and fertility. In all the older sections of the country there is no phrase more commonly used in speaking of a depleted soil, than to say it is "worn out." The real fact is that we have no really worn-out soils. We have soils in many localities which were originally fertile and productive, but which, through a long course of injudicious treatment and cropping, have gotten into a very unproductive condition. We have other lands that never had any store of fertility to be worn out—deep sands, which are naturally barren.

The "old fields" of the South are good examples of what men call worn out soils. They were cropped year after year in the old one-crop system till no longer producing a paying crop by the shallow plowing and methods of cultivation to which they were subjected, and have been turned out as perfectly worthless and utterly worn out. What then takes place? The ever-present broomsedge soon covers the land, and sods it over with its strong roots. Down among the broomsedge the pine seed, borne on the wind, find a congenial shelter, and a thicket of old field pines grows up. The pine tree has a wonderful subsoiler in its deep tap root, and it strikes down into the soil which the little one horse plow of the past never touched and year after year brings up food from below, and covers the earth with its fallen leaves making humus to replace that which had been used up in the careless cultivation of the past. After a while the forest is cut down for firewood and the owner finds that he has a new and fresh soil, which will make as much cotton or tobacco as it ever did. Nature has made this fertile soil by processes of her own, and with no help from the fertilizer manufacturer. But for the broomsedge and the pine tree a large part of the Southern uplands would to-day be a howling wilderness. If the man who clears the pines away goes on again to reduce the fertility of the soil, and finally turns it out again. Nature will renew the process, and will show that there is in all of our soils which are of a good mechanical composition, and originally productive, a practically inexhaustible supply of plant foods with any sort of proper management. What is it that Nature does for the restoration of the soil through the long years she takes to cure man's improvidence? Merely getting deeper into the unused store of mineral matter that had not been touched, and putting the accumulated vegetable matter on the surface soil to decay and restore the humus content to the soil which the constant cultivation of the past had used up. It takes unaided Nature long years to accomplish this, while all that she does the wise farmer can do in a few short years if he learns what is needed and the method of getting it.

One of the chief deficiencies in our old cultivated soils is organic decay making what we call humus. We are but just getting to realize the importance of this humus. It is valuable, not altogether for the amount of plant food it contains, though it does furnish a large part of the nitrogen, which is so hard to keep in good supply. but by reason of other effects which it has in the soil. It darkens the color of the soil, and hence makes it more retentive of heat. It prevents a clay soil from running together and baking hard in dry weather. Through the acids it contains it has a great solvent effect on matters of plant food otherwise insoluble, or very slowly

so. Chemists in the Experiment Stations have for many years been dividing up the phosphatic fertilizers which have been treated with sulphuric acid into the soluble, or water-soluble, the reverted, or citric acid-soluble, and the insoluble. Many of the Stations in their estimates of the value of the fertilizers carrying phosphorus have placed no value at all on the insoluble phosphoric acid in them, or at best a very low value. But we are fast learning that somethings happen in the great laboratory of Nature which our little laboratories told us nothing about, and it has now been found that in a soil abounding in humus we may place the insoluble pulverized phosphate rock, and it will rapidly become soluble and available to plants. But equally important is the fact that humus is more retentive of moisture than anything else that goes to make up a soil, so that a soil abounding in humus will stand more drought than soil of any other character. The vast importance of this fact will be realized when we reflect that plants cannot take any food from the soil until it is in perfect solution in the soil water. Hence the retention of moisture for this purpose is of the greatest importance.

But if you will pardon me, I would like to digress a while from the direct subject, and endeavor to explain to some extent how plants which make up our crops grow and get their food from soil and air. There is more ignorance in regard to the anatomy and functions of plant life, even among men considered educated, than about anything else apertaining to agriculture. But in order fully to understand how we are to improve our soils and make them more productive in crops, we should fully understand how plants live and grow in order that we may know how and with what to feed them.

There has been a great deal said of late years about a certain order of plants, the legumes, which, through the agency of certain minute organisms of the low order of plant life, known as bacteria, are enabled to get and combine in an available form the free nitrogen that exists so abundantly as a gas in the air. Of these will speak later. But is is not so generally realized that all plants get far more of their structure from the air than they get from the soil. More than ninety per cent. of the organic structure of every plant comes from the air, and less than ten per cent. from the soil. Growth in plants is made by the increase in number and size of little box-like structures called cells. Cut across the stem of any woody plant and examine the cut end with a lens of even moderate magnifying power, and you will see that the rings of growth are really circles of these cells, larger and thinner walled in the spring, and gradually becoming smaller and thicker walled as the close of the season of growth is reached, so that to the naked eye they merely look like rings. These little cells are filled at first with a formless substance similar to the white of an egg, which biologists call protoplasm. This is the only material in the plant that possesses life, and this formless living matter carries with it and constructs the material of which the cell walls are made. In short, the growth of a tree is made of constantly increasing circles of cells somewhat after the manner of building a wall with bricks, only that in this case the brick-maker and the mason live inside the bricks and form from their own substance the walls that confine them. In the first thin growing

cells between bark and wood the living mater in the cells is in continuous connection throughout the growing tissues. Later on, as the cell walls thicken, each lives to itself and carries on the making of the wood until all the living matter is used up and the wood is finished, and we call it "heart" wood, really dead wood, for the heart of a tree merely remains to hold the tree in position, while the life goes circling on around it. The heart may decay and the tree get hollow, but it will keep on growing, but if you cut through the growing cells all around the outside of the tree it will be killed.

The leaves as well as other parts of the tree are made up of these cells, but in these the living matter contains certain green granules which can easily be seen under the microscope, and which from their abundance give the naked eye the characteristic color of the leaf. In every leaf, and especially on the under side of the leaf, there are numerous minute openings which require a microscope for their detection. On each side of these openings there is a cell shaped like our lips, which give the openings the appearance of mouths under the microscope, and they are really the mouths through which the plant gets food from the air. In some leaves there are 70,000 of these minute pores to the square inch. They open into the interior of the leaf where the cells containing the green matter are loosely arranged. During the hours of sunshine, and at no other time, these mouths are open, and they close in sunshine when a plant wilts from lack of moisture so as to check evaporation and give the plant a chance to recover. In the air there is always a small percentage of carbon dioxide or carbonic acid as it is commonly called, which when in excess is poisonous to animal life. When the sun shines the mouths in the leaf open and the air with the carbon dioxide enters the leaf and comes in contact with the green granules. This green matter has the wonderful power to break up the combination of carbon and oxygen throwing back the oxygen to purify the air and taking the carbon for the use of the plant. Then in the leaf laboratory the food brought up from the soil in the soil water taken in by the roots is combined with this carbon and the living matter uses it for the work of what we call growth. The nitrogen, coming from the soil, continually renews the vigor of the living matter, while the materials from the air, which scientists call carbohydrates, because they are composed of carbon, hydrogen and oxygen, are used by the living matter to construct new cell walls and woody material. While the great bulk of the plant structure thus comes from the air, the matters that the roots take from the soil are nevertheless of vital importance. Let us study the root and see how the plant gets these materials from the soil. Place several layers of thick blotting paper in a saucer and wet them. Then on the wet paper lay some seeds of ordinary string beans. Cover the saucer with a pan of glass and set in a warm place. They will soon sprout and throw out roots over the wet paper. By examining these carefully you will see that the extreme tip is pointed and naked, making what is called the root cap. New cells of growth form back of this root cap and push it forward through the soil, and renewing it as it wears away on the outside from behind. Just back of this root cap you will see that a portion of the root is covered with a velvety coating of minute hairs. These root hairs are the only part of the root engaged in taking in food from the soil, and from

their minute size it is easy to understand why the food must be in solution, for these little hairs cannot absorb anything of a solid nature. As the root progresses in the soil the root-hairs dry up and new ones are produced back of the root cap, so that the roots are ever foraging in fresh soil. Since these root-hairs are the only parts of the roots engaged in taking food from the soil, and as they are always near the remotest tips of the roots it is easy to see why the man who runs a big plow through his corn and tears off the roots is depriving the plants of the power to get food from the soil till new rootlets are formed.

Knowing these facts in regard to plant life, how shall we apply them in the improvement of the fertility of our soils? The importance of the moisture-retaining character of humus in the soil will be better understood when we fully comprehend the need for the solution of the plant food for the minute root-hairs. There are a number of elements that must be supplied in the soil water in order that plants may live and grow, and if any of them are entirely absent the plant cannot thrive. These elements are nitrogen, potassium, phosphorus, magnesium, sulphur, sodium, iron, chlorin, silicon and calcium. Some of these are only used in minute quantities and some only by certain plants under peculiar conditions, and most of them are in such abundance as to be practically inexhaustible. Those which are used freely by all crops, and most apt to become deficient in the soil are nitrogen, potassium and phosphorus, and in rare cases calcium or lime. Nitrogen, potassium and phosphorus exist in smaller amounts than other essential elements in all soils, and are most rapidly taken up by crops. They exist in greatly varying amounts in different soils. A soil may be rich in nitrogen like the black prairie soils of Illinois, and yet be deficient in phosphorus, as has been shown there, and in hill lands like those of southern Illinois, potassium may be abundant, while both nitrogen and phosphorus are deficient. Some years ago I was invited to lecture at an Institute in one of the southern Illinois counties, and the subject assigned me was the restoration of worn out land. It seemed odd to me that Illinois farmers were already considering the exhaustion of their soils in a section formerly known as Egypt, from its great productiveness. When I reached there, however, I found that reckless farming and bad treatment of the soil resulted in the same conditions in Illinois as they do elsewhere, and I found washed hillsides and unproductive soils there, just as they exist in the uplands of the South and from the same causes. When I was a young man I was engaged in making railroad surveys from Minnesota to Texas. On the rolling prairies of the Grand Divide in northeastern Missouri they were then just turning the raw virgin sod, and they laughed at the idea that their soil would ever need manure, and boasted that they made 25 bushels of wheat per acre while eastern farmers made 10 to 15 bushels. But last year the farmers of Missouri paid two million dollars for commercial fertilizers, for their lands had gone down to 10 and 15 bushels of wheat per acre, while the lands in eastern and northern Maryland had gotten to making 40 bushels of wheat per acre in many counties. They have found that the essential elements for crop production can be exhausted in any soil, and that to keep up production some means must be taken to repair the waste. Single cropping has brought the famous

wheat lands of Minnesota and the Dakotas down to half the yield of these old Maryland soils.

Years ago, when wheat had fallen from the inflated price after the Civil War to $1.00 a bushel, I was traveling on a Chesapeake steamer to one of the best wheat growing counties of Maryland, and in conversation with a farmer, he said that they would have to give up wheat, for it could not be grown for $1.00 a bushel with any profit. At that time, and by the old methods of farming with the annual use of complete fertilizers, they rarely made over 15 bushels per acre and generally less. Since then that same farmer, and many others in the same section have grown wheat at a greater profit for less than a dollar than they did when it was higher. Conditions required better farming, and the farmers rose to the conditions and succeeded. One of my oldest friends in that section, who died a year ago at the ripe age of 86 years, and was an enthusiastic farmer up to his death, told me two years ago that thirty or more years ago, like all his neighbors, he was farming in the old way and spending a great deal of money for complete fertilizers and made 15 bushels of wheat per acre and often less. But that for the past twenty years, by the adoption of a short rotation and close attention to clover, he has averaged 40 bushels of wheat per acre, and 50 bushels had been made in the neighborhood, and that during that time the only commercial fertilizer he had bought was plain acid phosphate for the wheat that cost him an average of $9.50 per ton, and his corn crop had gone up from 40 bushels per acre to 75 bushels.

Recently certain alarmists in Europe have been prophesying dire calamity to the world by the failure of the wheat crop from the exhaustion of the supply of nitrate soda and other sources. They claimed that there would be a wheat famine all over the world if some new source of nitrogen was not discovered. Most of these statements were evidently for the purpose of booming the newly discovered source of nitrogen in calcium cyanide. But these Maryland farmers found years ago what I have been trying for a generation to impress on the minds of farmers in all parts of the country, that in any ordinary grain farming, the farmer who buys artificial nitrogen in any form is wasting his means for something which he can get without cost, and can even make a profit in the getting. Market gardeners whose crops have a special value and need early forcing can afford to buy nitrogen, but the farmer whose interest is in grain production need never buy an ounce of nitrogen in any form, if he farms right.

Professor Hopkins of Illinois recently said, "As a matter of fact at least 99 per cent. of the crops of the world are being produced without the use of commercial nitrogen and without artificial soil inoculation, and where abundant use is made of the legume crops in rotation, it will be possible in all future years, as it has been during the thousands of years in the past, for farmers to maintain a sufficient supply of nitrogen in the soil without the purchase of any artificial nitrogen.....There is more nitrogen in the atmosphere above every quarter section of land than is required for the entire annual corn crop of the world, and while bacteria work for nothing and board themselves, living on the roots of the legume crops and transforming free atmospheric nitrogen into combined forms for the use of growing crops, there is but one conclusion to be drawn in

regard to the great nitrogen problem, and this is, that there is no such problem except in the minds of people who ignore these facts."

We cannot too often repeat the fact that the farmer who practices a good short rotation, in which the legumes come frequently on the land, needs never to buy a complete fertilizer, that is one containing nitrogen as one of its constituents. The importance of this fact can be seen when we reflect that in the usual complete fertilizers on the market the cost of the nitrogen equals or at times exceeds that of the phosphorus and potassium in the mixture. It has been proven beyond any reasonable doubt that the agents which enable the legume plants to combine the free nitrogen of the air are the bacteria which live parasitically on the legume roots. It has been shown that unless these are present the legumes do not get the nitrogen, and that when they are present they do get it. Various theories have been promulgated to explain just how these bacteria do their work, but the exact method is still unknown, and it matters little to the practical farmer, since, for his purposes it is sufficient to know that they do get it. But every now and then some one rises up to say that the scientists are wrong. In a recent English daily paper one of these know-it-alls says that the idea that the bacteria do the work is all wrong, for that all plants have the same power, and all get nitrogen from the air through their leaves, and that the best way to increase the nitrogen in the soil is to use Thomas slag liberally. Since this slag is entirely composed of phosphorus, lime and magnesia it is hard to see how it can increase the nitrogen in the soil unless used to promote the growth of the legume crops. As a rule farmers should pay no attention to the science of the daily papers, for the average newspaper reporter is the most gullible of mortals about anything relating to scientific agriculture.

While we can get all the nitrogen we need in general farming from the air, we cannot get phosphorus or potassium, and when these are deficient they must be restored to the soil in some way. The element most generally deficient in our old cultivated soils is phosphorus. It is taken from the soil to form the bones of every animal raised on the farm, and the grain crops use it up radily. Potassium exists in most of our clay soils in abundance, but is apt to be deficient in sandy and especially in peaty soils like reclaimed swamp lands. In our clay soils it exists in the form of an insoluble silicate, which is slowly made available by the carbonic acid in rain water, and can be made more readily available by the use of lime or plaster. The chief problem for the farmer is to determine whether it is cheaper for him to get at the potassium in his soil or to use the potash salts.

The question is then narrowed down to the keeping up in the most economical way the supplies of phosphorus and potassium and putting them in a shape most readily available to crops.

When these are deficient, they must be added in some artificial way to the soil, and it depends very largely on the conditions surrounding the farmer as to how he shall do this. If he is so situated that he can profitably buy and feed the grain which has been grown on some other man's land, he can restore these elements and can keep up the fertility of his soil without the purchase of commercial fertilizers. Where he cannot do this with profit, he must buy these elements in the forms in which they are sold on the market. It is

merely a question of conditions under which a man is working. The main difference between his fertilizer and the commercial article is that in applying the barnyard manure he is adding humus-making material to his soil, which the commercial fertilizer lacks.

And right here comes in a question of farm economy. In what way can we get this humus-making material most economically? Shall we depend on hauling it there or shall we grow it already spread over the land by the use of the mineral fertilizers used on legume crops? As a rule, the best farming is done where some form of live stock husbandry is practiced, but it is nevertheless perfectly practicable to increase and maintain the productiveness of our soils through the use of legume crops, aided by the mineral elements used for the increase of these crops, and there may be farmers who will find it more economical in their conditions to have the humus-making material grown already spread on the land than to haul it there laboriously in the form of barnyard manure. Of course I would never advise carelessness in the making and use of the manurial accumulation which necessarily occurs on all farms. But I differ from many, who would under all conditions make a sort of fetish of a manure pile, and think that all farmers can afford to feed cattle at an actual loss and make it good in the manure.

As a rule, in many cases, it will be found that there has been a big price paid for the manure. By the proper use of the artificial forms of potassium and phosphorus for the increased production of the legumes it is perfectly practicable to get increased supplies of combined nitrogen for the use of succeeding crops, and to get a far larger amount of humus-making material than we could possible afford to haul there in stable manure.

But again the matter of farm economy comes in. This course assumes that all the legume crops are to be used directly as manure. We have grown, for instance, a crop of clover or cow peas which will make at least two tons per acre. This hay is worth for feeding on the farm $10 a ton. Can we, for any of our ordinary farm crops, afford to bury $20 worth of valuable feed in the soil as manure? This question becomes all the more important when we understand that in feeding this hay we can, by any reasonable care of the manure, recover at least 75 per cent. of its manurial value, and perhaps more, so that in burying it as manure we are losing the feeding value, so that the cases are very rare in which it will pay a farmer to ignore live stock feeding and depend on "chemicals and clover" for the increased productiveness of his acres. It is rather a question of possibility than of profitability, so that, argue as we may, we come back finally to the fact that the growing of forage crops, and the feeding of live stock, lie at the very foundation of improved agriculture with the great majority of farmers. We are too apt to consider only the market value of the feed in estimating the cost of animals fed, instead of the actual cost of the production of the feed, and the loss to the farm in selling it.

This brings me finally to the consideration of the practical methods for the improvement of the productiveness of our soils. In lecturing last winter at Institutes in Bucks county, near the city of Philadelphia, I was surprised to notice so little clover, and on urging the farmers to give more attention to clover and a shorter rotation I was met by the response "We cannot grow clover any more." The

same statement is made in all parts of the country in places where clover has thriven in the past, and the difficulty in getting clover seems to be very general. Two years ago I was requested to address the farmers of East Tennessee at their annual convention in the city of Knoxville on the Southern Cowpea. After I had concluded my address a farmer took the rostrum, and in a very emphatic way declared that he did not want the pea, and that the clover was the crop for him. I interrupted him, and told him that I had not said a word against clover, but would like to know why they did not grow it, for I had ridden the day before down the beautiful limestone valley of the Tennessee from Asheville to Knoxville, in the month of May, and had not seen one decent field of clover? The audience of 2,500 of the best farmers of East Tennessee applauded loudly at this, and many of them told me afterwards that the man who was so fond of clover utterly failed to grow it as most of them did. I told them then, and would repeat it now, that I believe the failure of clover, where it formerly succeeded, is due to one of two causes, either the exhaustion of elements in the soil needed by clover, or soil acidity, which is death to the bacteria that live on clover roots and get nitrogen for it from the air. Generally both conditions are present where clover fails. The farmers in Bucks county have been running their lands in timothy to sell hay in the market of Philadelphia, year after year till the hay crop is too small to pay before breaking the land again. The long and exhausting rotation is the chief trouble, and the soil has become acid thereby. Many years ago I took a farm in Maryland just south of the Pennsylvania line. It was a beautiful limestone valley, and the soil was fertile and well supplied with humus, but one field was pointed out to me as being clover sick.

I never took much stock in the clover sick idea, and I gave that field a good dressing of lime, and never saw finer clover than grew on it the next year. The soil was simply in an acid condition, and the lime restored the conditions in which the bacteria throve again.

The most thoughtful men in all parts of the country are fast coming to the conclusion that the constant use of the dissolved phosphate rock, or acid phosphate as it is called, has been the cause of soil acidity in many sections. We were not at first disposed to accept this, because we knew that manufacturers of acid phosphate were very careful not to have any free sulphuric acid in their goods, as it would interfere with the drilling of the article. But the investigations of the Ohio Experiment Station seem to throw further light on the matter. Dr. Thorne, the Director, believes that the effect of the acid phosphate in creating acidity in the soil comes from the fact that the soluble phosphoric acid is taken up rapidly by the crops, and the sulphuric acid is set free and at once combines with the lime in the soil, and forms lime sulphate, which does not sweeten the soil as the carbonate does. The soil, being thus robbed of lime, becomes acid and clover fails to thrive until lime is again added. He has found too that when the pulverized phosphate rock or "floats" is used in connection with stable manure it rapidly becomes available to plants and the use of this pulverized rock will entirely do away with the difficulty attending the use of the dissolved rock, in case the soil is well supplied with humus-making organic matter. Here again we see the importance of humus. The old long rota-

tion, in which the land is mown till it no longer makes paying crops of hay, so reduces the humus in the soil, as well as the mineral matter, phosphorus in particular, that clover does not find the food it requires, and the soil has become so acid that the nitrogen fixing bacteria do not thrive, and hence clover fails. The remedy is a shorter rotation of crops, legumes more frequently grown and fed on the land, the humus content of the soil increased by the legume roots and the manure made from feeding the hay, the growth of which has been promoted by applications of the phosphatic fertilizers and an occasional liming.

But here is where many farmers have made a mistake. Noting the good effects of a first liming of the land, they jump to the conclusion that lime is all the manure they need, and they use it in a lavish way, only to find finally that lime no longer gives them the great results it did at first, and that they are compelled to resort to commercial fertilizers. I know of sections in this State where, in my college days, the farmers applied 100 or more bushels of lime per acre, where on the same lands now but 25 bushels is used, since the farmers have learned the true office of lime, and have discovered that a smaller amount per acre applied more frequently in connection with the legumes, is better than a large amount applied with the notion that lime is a manure.

It is by no means the purpose of this paper to lay down rules for every farmer to adopt in the rotation and cultivation of his lands. That would be pure agricultural quackery. We must assume that every farmer who is a student of his profession, is wise enough to adapt any suggestions that we make to his own conditions. What we wish to impress on the farmers is the importance of a shorter rotation of crops, the regular use of legumes for increasing the available nitrogen supply and the humus in the soil and the feeding of stock better than timothy ever will, the giving to the legumes abundantly the mineral elements of plant food which they need in order to do better their work of nitrogen fixation, and leaving them to do the rest. In brief, the office of the commercial fertilizers should be the feeding of the crops that feed both the soil and the stock. If the legumes are well supplied with phosphorus and potassium you may depend on their producing the sale crops and feeding the stock. Just what a man's rotation, and what his money crops shall be must be determined by the man himself from his knowledge of his own conditions. But it is evident that the successful farmer of the future must be a legume farmer, and the man who puts his greatest efforts into the production of the legumes and the feeding of the forage will always have the money crops in larger amount than the man who gambles with a complete fertilizer merely to get more to sell off his land direct. On most of the soils of Pennsylvania the pulverized floats and lime will be all that he need buy for his land, and the legume farmer who keeps up with the advance in modern scientific investigations will farm more cheaply than the fertilizer gambler, while having more crops to sell. But he must be a student of his soil. Our soils vary so much even on the same farm, in their mechanical make-up and chemical composition, that different treatments and different fertilization are required. The chemist can tell you what a soil contains, but he can give you little information as to the availability of the matters in it, and the only man

who can find out what a soil needs is the man who cultivates it, and he must do it by careful experimentation year after year with the various forms of plant food separately and in combination as compared with check plots, and in this way can come very closely to what his soil is deficient in and what he need not buy. Crops vary too as to what they take from the soil, and the needs of special crops as well as the needs of the soil must be studied. One point I have reserved till now. This is the preparation of the soil for crops. A deeply prepared seed bed is of course important, but we must go slow in the deepening of a soil that has been plowed shallow for generations. Then whether subsoiling will pay or not will depend on the nature of the land. A flat clay that needs underdrainage will not be benefited by subsoiling till the drainage is made good. But on most of our rolling lands with a clay subsoil once in each round of a four year rotation will be found of advantage. But one thing is important, and this is a complete pulverization of the surface after plowing. I have found that in the preparation for fall grain every time the harrow went over the land till completely fined and compacted I was adding bushels to the crop.

When finally all our farmers know these things and practice them we may some day reach the time when we will be to a great extent independent of the seasons, and will find the day, which Secretary Wilson imagines is already here, when we will have no crop failures.

The extent to which the wheat growers have learned that the buying of commercial nitrogen is needless is shown by the fact recently stated by a fertilizer manufacturer in Baltimore, which is the headquarters of the fertilizer trade, that over 80 per cent. of the fertilizers now sold there consist of phosphoric acid and potash without any nitrogen.

In a recent number of the Ohio Farmer, Dr. Thorne, the Director of the Ohio Experiment Station, sums up the consideration of the value of humus in the soil thus: "The humus of the soil is, therefore, the great storage battery of its elements of fertility, mineral as well as nitrogenous. It is in this store, chiefly or altogether, that our crops find their sustenance. When this store is exhausted they starve, and in proportion as it is reduced they suffer hunger.....Sand and clay are but the skeleton of the soil; humus is its life."

MR. NELSON: Is there no circulation of sap in the heartwood of a tree?

PROF. MASSEY: No, none at all. Hold on a moment, heartwood, as you know, lasts longer than sap. Decay starts in where there has been death. There has been no death in the heart, hence there is no decay, which starts in there, no blue mould as there is in sap wood. This dead matter lives on sap. It don't live on the heart.

MR. NELSON: I have an oak tree in my corn field, and I cut a groove around in it an inch deep on the fifth of May a year ago. I have done that several times and it is leaving out this spring and in blossom, just as nice as it ever did, and it will do that the next four years.

PROF. MASSEY: Well, it will die. I know that they will do that sometimes, but it will die.

QUESTION: While the southern farmer had poorer land by buying fertilizers was he not poorer financially?

PROF. MASSEY: Well, as I said, the southern farmer has been dependent upon growing cotton upon the same land year after year and I know of some land in North Carolina that has been in cotton seventy-five years in succession. The land has certainly gotten poorer not because of the fertilizer, but because the owner has been enabled to draw still further on the natural resources of the land. He puts a little on there, and the plant uses a little of that, and draws on the soil still further. It was really the lack of fertilizer, rather than the amount that he used; he has grown poorer financially because he has wasted his substance; he has wasted his bank account.

QUESTION: Please give an ideal short rotation for the Pennsylvania farmer engaged in general farming.

PROF. MASSEY: Now gentlemen, I do not like, as I said, to lay down rules for any particular man or particular section. We have certain rotations that have been found successful in various sections of the country. We have Mr. Cherry's rotation of potatoes and wheat and clover out in Ohio which has proved successful with him, but those farmers that I spoke of who are growing wheat so successfully on the eastern shore of Maryland have adopted a rotation of corn and wheat and clover. One man there who came out of the Confederate Army as poor as the rest of us started in there with nothing, went into a little business and got a little money ahead, and land was cheap in that section at that time. He engaged a man to farm for him on shares, and laid down the rotation, and the farm began to improve, and pretty soon he got money enough ahead to buy another farm, and there was a man ready to go on it on the same terms; that is, they would divide the cost of cultivating that farm as nearly as possible, and it was understood that all the roughage was to be used up on the farm, and the landlord take his pay in the manure, and the tenant soon found that it was a profitable business.

Year after year this man bought farms in that same neighboorhod until this man McKinney died about a year ago, owning forty-two farms. His last wheat crop was 120,000 bushels, and men living near his farm are buying land and renting it out in the same way, and getting improved farms. That system of tenantry has been wonderfully successful there. Lawyers and business men are engaged in buying land, improving land and in renting it in the way I have mentioned. That system has been successful there. Their main money crop is wheat. Their object is to get as large a crop of wheat as possible, and then to manure their clover crop and put it in corn. They used to think, under the old system, that corn-land, was very poor for wheat; now they get the best wheat off of corn-land. I was in Maryland two years ago and had pointed out to me a twenty acre field from which a man had sold a thousand bushels of wheat, but that was the old land that had been cultivated since the early settlement of the country and only in recent years have they realized what that land could do in the way of wheat growing.

MR. RODGERS: Why will a tree not grow with the leaves all plucked off as they grow?

PROF. MASSEY: The leaves are the laboratory of the plant; they construct everything that tends to make growth, and without a laboratory for the plant, you can't get the growth, of course. There are some things like the evergreen tree, or the passion plant or like the cactus plant that act in the same way as leaves.

MR. J. W. COX: Can as good results be obtained by plowing manure under as applying it to the surface of the soil on a grass crop? Can the same value in plant food be obtained, or is there any loss in plant food by plowing the manure under? Will the plant food in manure, plowed under leach away beyond the reach of ordinary farm crops?

PROF. MASSEY: Well, I should say that would depend upon a great many conditions. We have found in certain experiments that manure spread in the fall on the surface and let lie there all winter—we have compared that manure plowed under at the same time, and other manure applied in the spring and plowed under when the whole was plowed, and we have found that that manure that was applied in the fall and let lie there on the surface all winter, gave the biggest crop of the three. That was one single experiment and made at the New Hampshire Experiment Station. Now one swallow don't make a summer, but as a rule I have found in the South—now climate and conditions differ—but as a rule I have found in the South the nearer you can keep the manure to the surface, the better, because it adds there a mulch and tends more to preserve the humidity of the soil. Therefore I believe that the best way to use manure is to keep it as near the top of the ground as possible.

MR. COX: How many pounds of nitrate of soda is necessary per acre for a top dressing of an old meadow, where the soil is in a fertile condition?

PROF. MASSEY: None at all, if the soil is in a fertile condition. The question assumes that the soil was not in a fertile condition; that it needs nitrate of soda. Nitrate of soda is a very good thing for some land for a grass crop, but as I have said, we ought to farm economically. It is necessary to produce an article so as to leave to the farmer the largest margin of profit without injuring his land. Some years ago a man down in South Carolina made 254 bushels of corn on an acre, and if he hadn't got a premium of $500 from "The American Agriculturist" and $500 from the State of South Carolina he would have lost money on it, so that the average good farmer wants to make good crops with the margin of profit on his side, and not to spend more than he receives in return as some millionaires do. Now I should apply—if I had special need for stimulating a crop of grass—I should apply about 100 pounds per acre of nitrate of soda. It is a very good thing, and in a great many cases it may be very profitable.

QUESTION: At what season of the crop would you apply this nitrate of soda?

PROF. MASSEY: I would never apply nitrate of soda except when the plant is in active growth and then would not apply it when it is moist from rain or dew.

QUESTION: Is it not well to apply the nitrate of soda early in the season?

PROF. MASSEY: Yes, you ought to apply it at the time of active growth, because otherwise you lose a great deal of it. It is washed away in the drainage water.

QUESTION: Is not nitrate of soda more beneficial by putting it on in a dry season?

PROF. MASSEY: No, I think not; if it is very dry, you must have moisture enough to dissolve whatever you put there, even so available an article as nitrate of soda. I do not think a dry season would increase its effect. Heavy rains might wash it away; there is no doubt about that.

QUESTION: How much commercial lime would you apply per acre?

PROF. MASSEY: That depends upon the kind of lime. Sometimes it is very strong in magnesium and not so good for some soils. Magnesium is a plant food, but we do not want too much of it. With good, pure lime, I think that 20 to 25 bushels is a plenty, if you are practicing a short rotation, and liming in about once in four to six years.

QUESTION: Would not the amount of lime that would be beneficial to the land depend very largely upon the kind of soil? For instance, a very heavy clay soil will respond well to a large application of lime than a looser soil will. Won't the amount of lime depend more upon the character of the soil than it does upon the quality of the lime itself?

PROF. MASSEY: It depends very largely upon the amount of organic matter in the soil, because some experiments seem to show that the reason why lime acts beneficially in the promotion of the nitrification of this organic matter, is, that these bacteria can get carbon from the calcium carbon which green plants can't do. Now whether that is exactly true or not, I am not prepared to say at present, but that their growth is promoted by the presence of an excess of lime in the soil, and that where then there is a great abundance of organic matter, lime is more apt to give good results, than where there is but little.

MR. RODGERS: Would the beginning of May—the first two or three weeks in May be too late?

PROF. MASSEY: That would depend very much upon the locality.

QUESTION: Do you think that clover failures are due as much to a poor, mechanical condition of the soil, that is the lack of humus, as to any other cause?

PROF. MASSEY: I think, as I said, it is probably due to the deficiency of humus in the soil, as well as to acid conditions.

QUESTION: How much lime should be applied to insure a good growth of alfalfa on a medium heavy clay soil on which clover can be grown with a fair degree of success?

PROF. MASSEY: I think the same amount would do very well for clover or alfalfa, and alfalfa particularly needs lime. I never succeeded with it without lime.

MR. GLOVER: When second-crop clover is not filled with seed which is better to cut for hay and feed stock at no great profit or leave on the land to be plowed down the following spring for corn, taking the question of labor saved into account?

PROF. MASSEY: I think for most farmers where that second crop cannot be used profitably for feeding he had better leave it where it is and take the profit in the corn the next year and in the seeding of the land for clover when it is broken again.

QUESTION: In regard to saving for seed. If clover is hulled and the hulling spread over a field, will it give about the same benefit as it would if it was left uncut?

PROF. MASSEY: O yes, I think so. You know the need for germination, moisture, and the presence of oxygen, and if any of these are absent, the seed is not going to grow.

MR. GLOVER: Is an application of 40 bushels of lime to a soil, fairly well supplied with humus, every twelve years using too much lime where a four year rotation is practiced?

PROF. MASSEY: No, it is not using too much lime, but putting too long a time between applications. They better use half as much and use it twice as frequently.

QUESTION: What is the best legume rotation for the general farmer?

PROF. MASSEY: I am going to leave the farmer to work that out for himself.

QUESTION: How may the thinking faculty be better developed in a shallow mind?

PROF. MASSEY: Well, by the use of any faculty, we can certainly improve it. If a man will put himself to reading and thinking, he can certainly improve his thinking faculties.

QUESTION: Why do crops thrive near locust trees and not near walnuts?

PROF. MASSEY: Locust trees are legumes.

QUESTION: Nitrate of soda and potash salts have a tendency to draw moisture from the air. Is is probable that the benefits derived from their use is in a measure attributable to the water supplied as to their chemical constituents?

PROF. MASSEY: I think that the matter of moisture from the air would have very little to do with the effect of these chemicals; you have got to get a larger amount of moisture by a good deal than would come from that source.

QUESTION: Please repeat that statement in reference to the use of lime on alkaline soils, etc.

PROF. MASSEY: I did not speak of using lime on soils already alkaline; I spoke of restoring feeble alkalinity in soils which is favorable to clover.

QUESTION: Is it not true that early fruiting in fruit trees, shortens the lives of the trees, the same law holding true in animal life? If so, isn't it a question if trees should be thrown into early fruiting, especially a fine tree?

PROF. MASSEY: Well, that is a matter for a man to consider in regard to the profits which he is seeking to get out of a tree; whether he is going to profit for a few years or for many years. There are some varieties of trees that are early bearers and usually short-lived trees. The longest lived apple trees are a great many years coming into fruiting.

QUESTION: Many farmers take all bark off of the trunks of old trees, claiming that it produces fruit. Why do these trees not die? Does not the sap run between the cambium and bark?

PROF. MASSEY: Well, the new growth, if you take it at a certain time of the year, if you are careful not to too much interfere with what is called a cambium layer or the younger cells and bark that exert the drawing influence on the air, it may be done, but it is a serious check, however, to the tree; it may throw a very rapidly growing tree into fruiting, but I think there are other methods that might be used which are safer. You may make a mistake and kill the tree.

QUESTION: Would you use cow peas instead of clover when you can grow either? Which should have the preference?

PROF. MASSEY: I should use cow peas to put in as a catch crop in any place that I had for them vacant. I should depend upon clover as a regular thing, all the time.

MR. SEEDS: What variety of seeds should you use?

PROF. MASSEY: It depends upon where you live; whippoorwill is good for the average conditions in Pennsylvania.

MR. SEEDS: Which would be the best in a short season?

PROF. MASSEY: The New Era and Warren's Extra Early; they are both seeds that will ripen in sixty days. Wherever you find that you have ninety days of warm weather, the Whippoorwill will do very well.

QUESTION: Is it too late to sow them now?

PROF. MASSEY: No, in North Carolina I sowed anywhere from the latter part of May to the middle of August; here you can sow from the middle of June up to July, I should say.

QUESTION: Would these be very much superior to the Canada field pea?

PROF. MASSEY: Oh yes, we have tried the Canada field pea in the South; it is certainly unsuited to climate conditions there.

QUESTION: Where can I get the New Era cow pea?

PROF. MASSEY: You can get it in Philadelphia; I don't know whether my friend Moore has it or not. You can get it of Mr. C. W. Wood & Sons, of Richmond, Va., I know.

MR. BEARDSLEE: Will it flourish well in the northern half of Pennsylvania?

PROF. MASSEY: Except on special soils, I very much doubt it. If you get a warm sandy soil, it might. Now I had a photograph sent me the other day of a very successful field of cow peas grown in Wisconsin. I met a lady dairyman in southern Vermont who said she couldn't get along without it.

MR. HALLOWELL: Is green rye to height of three feet advisable to plaw down in order to increase fertility? Or, shall I take off same after-blossom and apply commercial fertilizer to produce corn for silo filling?

PROF. MASSEY: I would plow the rye under for a cultivated crop. Now in the South we have found that it never does to plow under a green crop in hot weather. In the spring of the year we can plow under there a green crop for a cultivated crop like corn very successfully.

QUESTION: What time of the year and to what crop do you apply lime to correct soil acidity? How many bushels per acre do you apply?

PROF. MASSEY: Apply it to the corn crop which they are going to follow with wheat and clover. Ordinarily if my land was adapted to give me a good stand of clover, I would try it on clover the second spring.

QUESTION: Do you recommend feeding this to stock?

PROF. MASSEY: Ordinarily, I would turn it down, I think.

QUESTION: Where we do not have the humus had we not better use the acid phosphate and apply lime?

PROF. MASSEY: Yes, I suppose you had better apply the dissolved rock in that case; but if you will use it with your stable manure and abandon all this pulverized float, it will become very available, and not only that, but it will save manure to a great extent.

QUESTION: The Pennsylvania valleys are usually covered with a deep, clayey, loamy or shaly soil, the hillsides the same but shallower, but under all we have no end of raw soil-making material. We use the short rotation and fill the soil with vegetable matter. Would you advise the use of lime, and how much to the acre?

PROF. MASSEY: I did talk about that; I would use lime in regular rotation.

QUESTION: When there is no trouble to get clover, do you believe it good to practice a two-year rotation, that is clover every other year?

PROF. MASSEY: No. I would make it a little longer; say three or four years.

QUESTION: In a three-year rotation of wheat, clover and potatoes, will the potato crop be benefited more by applying commercial fertilizer after harvesting the clover than by applying when planting the potatoes, the second crop of clover being left on the ground and plowed under in spring?

PROF. MASSEY: I would apply all the fertilizer to the potato crop.

MR. CAMPBELL: Why is it that fertilizer manufacturers are asking almost as high prices for floats as for the acid phosphate?

PROF. MASSEY: Because a trust controls the whole thing.

MR. C. O. MATTERN: What variety of cow peas would you advise this far north?

PROF. MASSEY: I have just stated that.

MR. MILLER: Where we lime every third year (lightly) is there any danger of acidity?

PROF. MASSEY: No, I don't think that is really advisable. I would not lime more frequently than once in four to six years.

MR. MILLER: Would you sow all clover as the third or fourth year rotation?

PROF. MASSEY: In my experience, I would prefer all clover.

QUESTION: Can a repellant be introduced into the circulation of a tree to prevent insect injury to the foliage or fruit?

PROF. MASSEY: I know of none at all.

MR. HOOVER: What formula of commercial fertilizer is best adapted for the tobacco plant?

PROF. MASSEY: Commercial fertilizer which should contain at least ten per cent. of potash in the form of hydrosulphate, not in the form of muriate. The nitrogen is best obtained by a small portion of nitrate of soda to start the crop and dried blood is the main source of organic matter; acid phosphate would cause the tobacco to be bony.

QUESTION: Is it best to plow down the full-grown crop of scarlet clover, or first to make the crop into hay and then plow the field for corn or other crops?

PROF. MASSEY: It depends upon whether a man can feed it profitably or not. I think as a rule it is harder to cure than any other clover, in my experience, and I would generally plow it under.

QUESTION: How would you thicken an alfalfa plot?

PROF. MASSEY: By harrowing it over and sowing in some more seed.

QUESTION: What price should we be able to get float for per ton?

PROF. MASSEY: About seven dollars and a half.

QUESTION: In a corn, clover and grain rotation, will you give more of the details of the sowing and harvesting of these different crops?

PROF. MASSEY: Well, take "The Practical Farmer."

MR. HUTCHISON: Mr. Chairman: We are to have to-night a memorial address by Mrs. Wallace, and I move that an invitation be extended to Prof. Massey to deliver a talk of ten minutes and to Joel Herr, after Mrs. Wallace delivers her address.

The motion was duly seconded.

DEPUTY SECRETARY MARTIN: Mr. Chairman, kindly let Mr. Nelson make a statement which may give more light upon the matters involved in this motion.

MR. NELSON: Mr. Chairman, I have been asked to invite the visiting comrades who are here to remain at the Memorial Service which will take place this afternoon. I understand that the address of Mrs. Wallace will come immediately after the services which are to be held here.

The DEPUTY SECRETARY: Mr. Chairman, I would just briefly state that this Memorial Service is of a greater importance and appeals more directly to our hearts and feelings than any other service or any other holiday in the United States, and we gladly join with the Grand Army of the Republic in this service, and yield a portion of the afternoon's program for that purpose, and if it is agreeable to the Grand Army and their portion of the program, we will join and have Mrs. Wallace follow with her address which is given on the program for this evening, and then the motion of Mr. Hutchison that the veterans who belong to this convention, be invited to take part in the program in the Memorial Service for this afternoon, and then after the services are concluded, if time will permit, we will take up the round-up section, devoted to the matter of local institute management.

We probably will have finished this service about two o'clock or thereabouts. I make this suggestion in order that we may all join

together in this, one of the most sacred days of the year for those who love this great country of ours.

MR. HUTCHISON: Mr. Chairman, I will withdraw my motion in regard to this evening, but I would renew it so that the gentlemen named may speak this afternoon. I think it will be very fitting to have the Blue and the Gray join in the services, and therefore I make that motion.

The question being on the motion, it was agreed to.

The Chairman announced that the Memorial Service would take place at one o'clock.

On motion, duly seconded, the meeting adjourned until one o'clock P. M.

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## MEMORIAL SESSION.

Clearfield, Pa., Court House, 1 P. M.,
Wednesday, May 30, 1906.

At the hour designated the Memorial Service was conducted under the auspices of Post 179, G. A. R., of Clearfield, Pa. The order of exercises was as follows:

Singing by Quartette.
Prayer by the Rev. Mr. Miller.
Singing by Quartette.
Introduction of Orator by Chairman.
Oration by Rev. Mr. Enders.
Singing by Quartette.
Address of Prof. Massey.
Address by Mrs. Wallace.
Address by the Hon. Joel Herr.
Closing Song, America, by Audience.
Closing Prayer, by Rev. Mr. Reily.
Distribution of Flowers to Veterans.

Mrs. Wallace, as per program, delivered the following address:

## MEMORIAL DAY.

By MRS. MARY A. WALLACE, *Ellwood City, Pa.*

Mr. Chairman, Comrades, Ladies and Gentlemen: As many are gathered here from almost every section of the State, attending the Farmers' Normal Institute on this Memorial Day, it is fitting that we should specially remember the soldier dead of Pennsylvania. But friends, you cannot honor these dead of ours. They have passed beyond our reach. History hath claimed them for her very own. Upon the broad facade of the Republic, their names are

indelibly inscribed. Grandly they responded to their country's call, "to arms," and nobly did they do their duty as soldiers. Wherever there was need of the bravest, there were the Pennsylvania volunteers, and when the high tide of the Rebellion threatened to engulf this old Keystone State, it was one of her sons who led the forces of resistance, that turned it backward and saved the Union—Meade, Gettysburg.

Gettysburg! Gettysburg! Pennsylvania is proud of thee, the nation's most hallowed shrine before which she bows her head in reverence and honor to-day.

The graves of many of these dead of ours, are kept green in our National Cemeteries. Thousands are resting in the quiet churchyards and cemeteries throughout the land, while still other thousands sleep where they fell by mount, and stream and sea, the place of their sepulture, unknown to all save God and His angels.

But whether they lie beneath the ocean's wave, or in the dismal swamp, beneath Southern palms or Northern pines; in the dark ravine or on the mountain top, a grateful nation pays its tribute of devotion to their loyalty to-day.

May we not hope, friends, that in that land where there is no war, where the sun of peace sets, that there is to-day a grand rendezvous, a grand rally of all the soldier dead who have borne arms in the defense of our country here on earth, and that they can see and know and are rejoicing in the prosperity that hath blessed the land for which they suffered so much. And may we not hope, too, that the men in Gray who met the men in Blue with bayonet and bullet on the many gory battle-fields, are with them, are rejoicing with them, and, figuratively speaking, drinking with them from the same canteen.

Comrades of the Grand Army, as memory slowly fills up the lines in your furrowed faces and obliterates the gray hairs on your heads, we recognize you as the "boys of '61," who, in the full vigor of early manhood, when face and form were aglow with the fire of youth, went forth so grandly with the Comrades whose graves we decorate to-day to battle for your country.

Each year your skeleton ranks are being reduced still more by the details ordered to join the forces beyond the river, but to you who still remain in camp on this side, I will speak a word of encouragement. When you have listened to the solemn sound of taps for the last time, when the reveille shall waken you no more, and you have turned in for that long, dreamless sleep that comes to each of us, may it comfort you to know that so long as the Stars and Stripes shall kiss the freeborn breeze, so long shall your deeds be spoken, so long shall your names be carved in the historic marble of your State and Nation, so long shall your descendants and all citizens in whom you have by your example kindled the fire of your unquenchable patriotism, assemble on each recurring Memorial Day to recount your struggles and to place a flower upon the soil that shelters a soldier's bivouac.

And now friends, in closing, I would say that although Memorial Day is a day dedicated to the memory of our soldier dead, it should also be a day of introspection by every citizen.

There have been other republics, great and grand and strong, but where are they to-day? Where is Greece, that mother of re-

publics, whose hills were the birthplace of freedom? Greece, that in the centuries of her existence as a republic had risen to the highest plane of learning, art, science and literature. Nothing remains of that once powerful republic except the imperishable thought that has come down to us from her poets, her philosophers, her statesmen, her sages, and through which those brainy old Greeks are today in this twentieth century the

"Sceptered sovereigns that rule our spirits from their urns."

And Rome, great and mighty Rome, what of her? Rome whose transformation from a republic into an empire, was one of the greatest crises in human events. Her history is recorded under the heading of "Republics that have been." Is it possible that the record of those republics is to be the record of the republic of the United States of America? Aye, friends, it is possible, but let us hope not probable, and that our old ship of State may take warning, and avoid the rocks upon which they were wrecked.

One of these, to which was largely due the downfall of Rome, was what in these days would be termed her "territorial expansion." As Rome grew older she became ambitious to rule the world, and began reaching out after this kingdom and that kingdom, until in the end, it might be truly said that she fell by her own weight. Rome learned too late that the difficulty in maintaining a republican government is largely in proportion to the extent of the area over which it is established.

Another cause for the downfall of these great republics, was the decay of those peculiar virtues so necessary in upholding a popular form of government. Patriotism and love of country, so dominant in the older Greeks and Romans, became swallowed up by the gross vices of lust for power, wealth, pleasure and personal ambition, and for years before the end they were only Republics in name, in reality an aristocracy of wealth, luxury and pride. Social and political corruption ran riot while the rich became immensely rich and the poor desperately poor.

And so I say, friends, that in these days of greed and graft, when great corporations are demonstrating most forcibly that they have no souls, when millionaires are made in a night, when the wealth of the land is being centered in the hands of a few, when fathers and mothers will barter away their daughters to some scion of royalty for his title, thus showing the aristocratic tendency of the times, it is important that we stop and think; that every citizen should, on this Memorial Day, ask himself the question, allowing his conscience to answer him truly, whether or not he is living up to the high ideals of true citizenship, and the words of the immortal Lincoln, "from these honored dead take increased devotion to the cause for which they gave the last full measure of devotion, and highly resolve that these dead shall not have died in vain; that the nation shall, under God, have a new birth of freedom, and that a government of the people, by the people and for the people shall not perish from the earth."

And now to our soldier dead, farewell! To our soldier living all hail!

Professor Massey was next introduced, and coming as a native of the South, and having fought in the Confederate army in the great conflict, added interest to his remarks.

He said people talked about the New South. It was the Old South in reality represented by the younger men. While it was true that he was a representative of "The Lost Cause," he said he thanked God that the cause was lost. It was a blessing to the South; the whites were emancipated as well as the blacks. They never knew until they were taught by experience after the war, the stuff that was in them. To-day they stand by the flag as loyally as their northern brothers.

The Hon. J. A. Herr, a veteran, and member of the State Board of Agriculture, also made appropriate remarks along the same line. After the exercises of the meeting were concluded, a parade was formed and marched to the Cemetery.

Meeting adjourned to 7.30 P. M.

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Court House, Clearfield, Pa., 7.30 P. M.,
Wednesday, May 30, 1906.

The Institute assembled and was called to order at the designated hour by Mr. T. E. Orr, Chairman.

MR. ORR: The first topic to be taken up this evening is "The Breeding of Poultry for Egg Production; Housing, Care and Management," (illustrated by lantern slides,) by Prof. James E. Rice, in charge of Poultry Husbandry, Cornell University, Ithaca, N. Y. It gives me great pleasure to introduce to this audience Prof. Rice, of Cornell University, as the lecturer of the evening, and I want to say to you that Prof. Rice has done more for the poultry interests of this country than any other man, or any other five living men. I have seen the work he has been doing for ten years, and I want to say that the work he is doing in his position at Cornell University at Ithaca, where he has occupied and still occupies the position of Professor of Poultry Husbandry, has been of the very greatest value; and now without extending these remarks, I will say that it is a privilege and a pleasure to introduce to you to-night, Professor Rice, and I hope you will join in giving him a hearty greeting.

Prof. Rice addressed the audience as follows, illustrating his talk by lantern slides of a very interesting character, showing the latest methods of poultry raising in various parts of the country:

## SOME POULTRY PROBLEMS.

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By JAMES E. RICE, *Assistant Prof. of Poultry Husbandry in Cornell University, Ithaca, N. Y.*

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Ladies and Gentlemen of the Institute: It is a special pleasure to attend this meeting. First, because it is on one of the largest poultry states in the Union, ranking among the first six in importance and value of its poultry and poultry products. Second, because I have long desired to know more about the institute workers of Pennsylvania whom I have read about and learned so much about

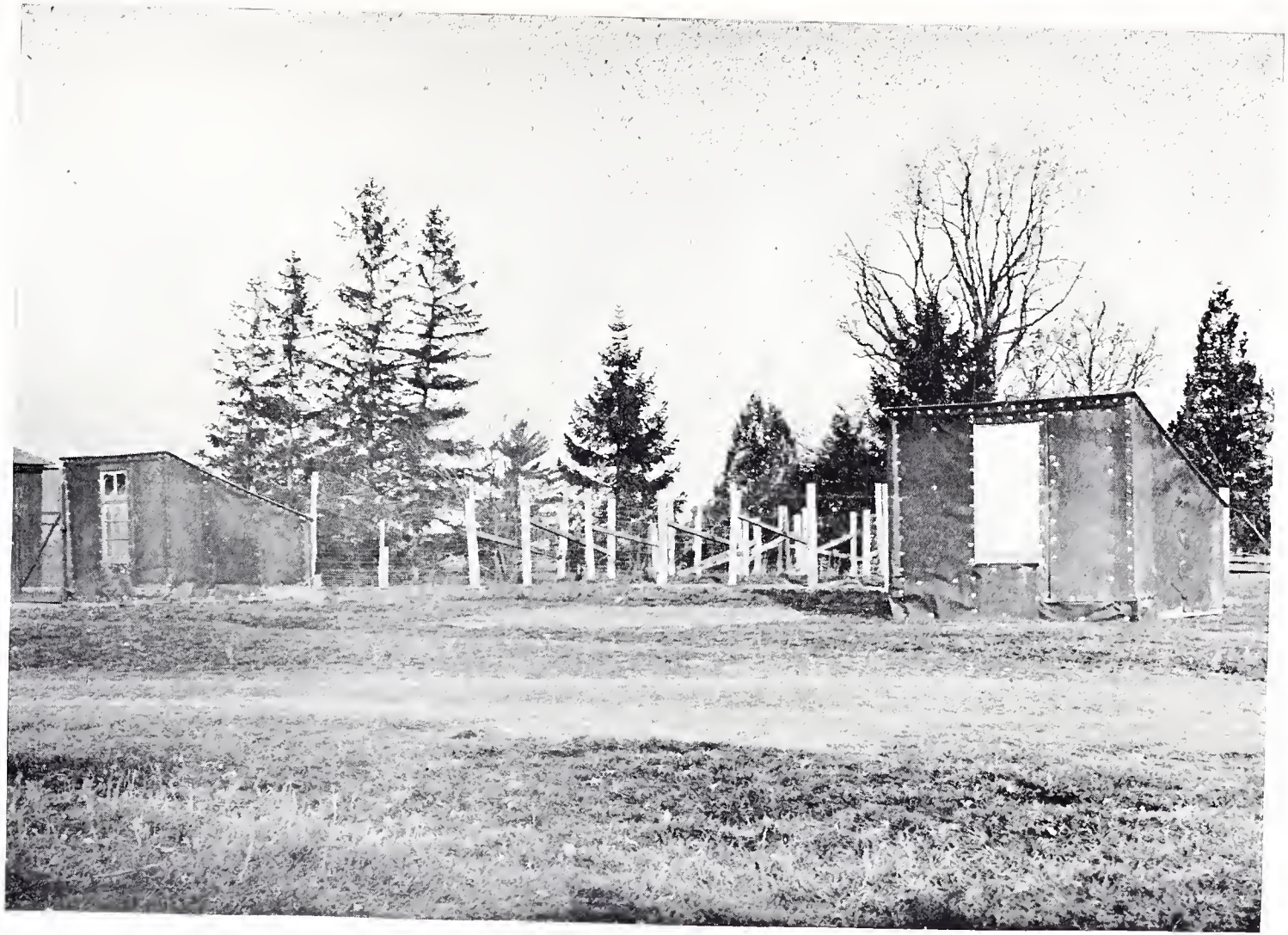


Fig. 1.

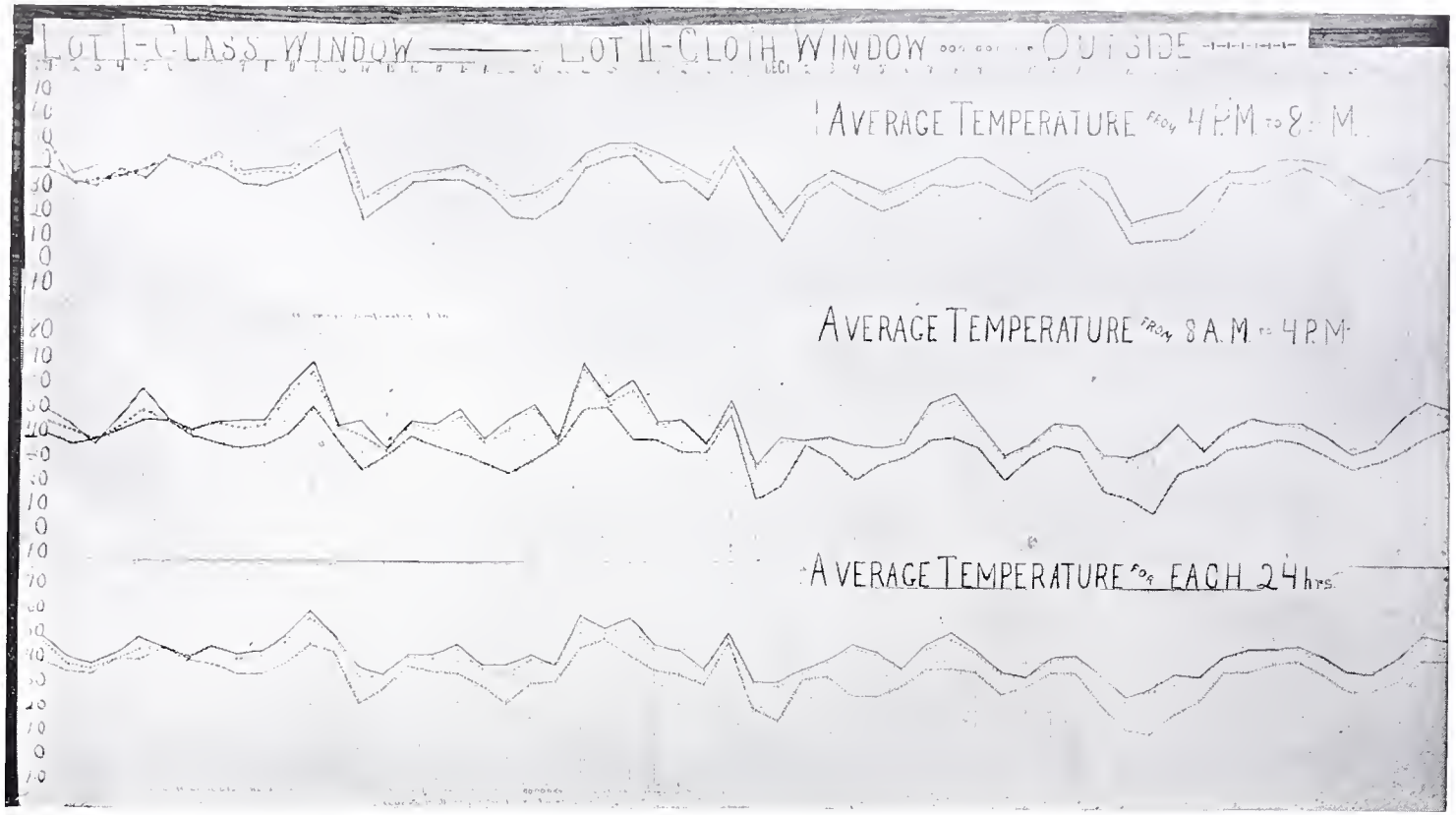

LOT I-GLASS WINDOW
LOT II-CLOTH WINDOW
OUTSIDE
AVERAGE TEMPERATURE FROM 4 P.M. TO 8 A.M.
AVERAGE TEMPERATURE FROM 8 A.M. TO 4 P.M.
AVERAGE TEMPERATURE FOR EACH 24 hrs.

Fig. 2.

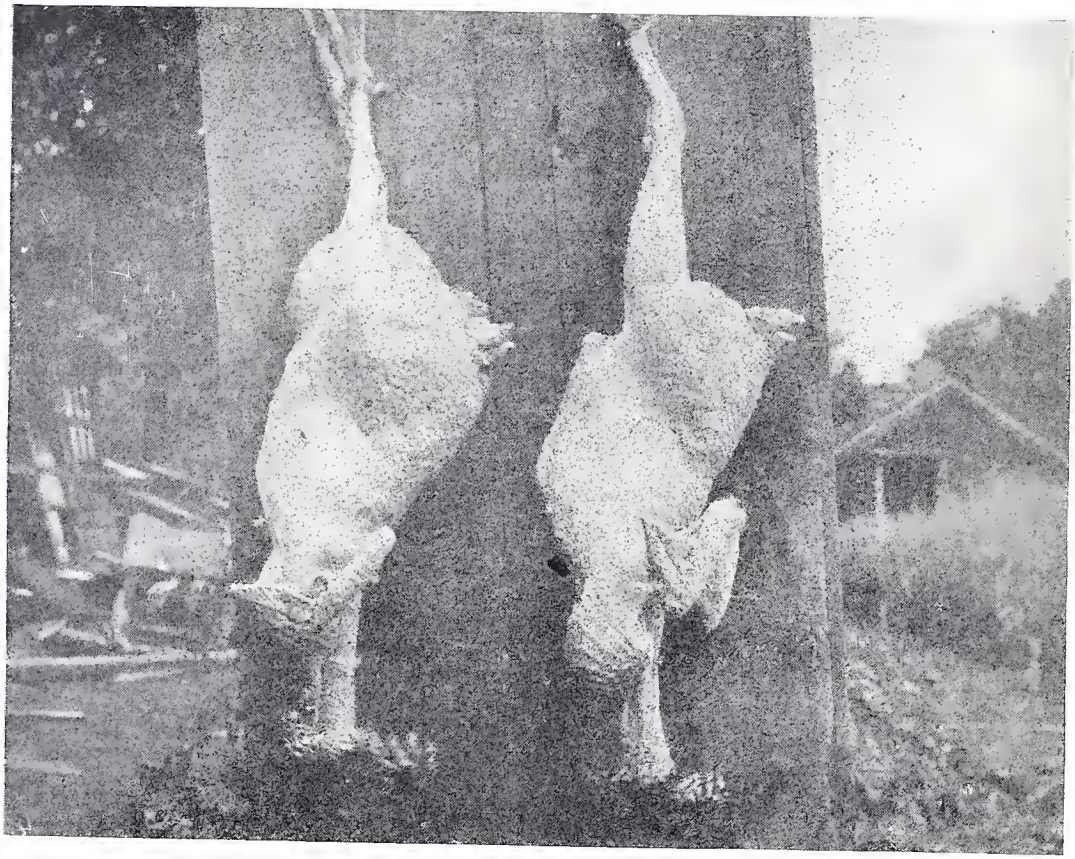


Fig. 3.

Fig. 4.

through our mutual friends, T. E. Orr and Alva Agee. Third, because I wish to reciprocate in some measure the good which Mr. Orr has done for the State of New York through his many practical lectures at our poultry and farmers' institutes.

Poultry husbandry is just coming to its own. The people, now, as never before, are beginning to realize the great extent and the importance of poultry keeping. They realize that almost every farmer and many village people are interested in poultry, and therefore poultry bulletins and other literature issued from our agricultural colleges and experiment stations is one of the easiest and most effective ways of reaching the people. Notwithstanding the importance of poultry husbandry from an educational, as well as an economic stand-point, only three or four states in the Union are giving it any special recognition as a subject for instruction or investigation. The few efforts which have been made to establish poultry departments in the experiment stations and agricultural colleges, are meeting with such marked approval on the part of students and poultrymen generally, that a large number of states are now considering seriously the advisability of establishing poultry departments as strong and effective as any of the other departments of the college or the experiment station. They are wise in this decision. No money that is appropriated by the State is expended more wisely than that which is devoted to the education of the farmer in the methods which will enable him to produce better products to feed the world, and to do so most economically and effectively. One cent saved on each dozen of eggs produced in the State of Pennsylvania, one more chicken raised on each farm in the State, one dozen more eggs produced each year by each hen in the State, would produce a product so great that none of us would have guessed its value. Nevertheless, such are the possibilities to be brought about in this and in every state through investigations and by instruction at the Agricultural College, the Farmers' Institutes, the Reading Courses, etc. Indeed, such a result is taking place in several states. It is imperative that each state undertakes this work in order to keep up with the race and sharp competition for the markets of the world. The poultrymen in the State which does not encourage and help them cannot win out in competition with the states where they have up-to-date poultry schools and an experiment station where the interests of poultrymen are given a proper share of attention.

My purpose, however, in speaking to you this evening, is to discuss some of the important problems confronting poultrymen and to illustrate by lantern slides some of the things which it is difficult to express in words. The field is so large and the time so limited that it is impossible, in the short space of an hour, to touch upon many topics.

One of the most important poultry problems is, how to maintain and increase the vigor of the flock. Constitutional vigor plays an important part in the production of large numbers of eggs, of fertile eggs, of hatchable eggs, and of chickens which rather live than die. How best to breed, feed, raise, and house poultry so that each year the flock will be more hearty and vigorous than before, is the question around which all of our investigations at Cornell University, center. One of the principal factors which has contributed toward lower vitality in the flocks of the country, is the improper construc-

tion of poultry houses. The first slide, Fig. 1, shows two colony houses, 8 feet square, similar in every respect except the window openings.

These houses were used in order to try and determine the comparative influence of a glass or a cloth window in the poultry house. Each day for the entire winter, records were kept of the temperature, moisture and density of sun-light in each house, the amount of food consumed, number of eggs laid, and the mortality in each house. The only difference between these two houses was, that one had a glass window while the other had a cloth window made of thin muslin. Fifteen early hatched, Brown Leghorn pullets occupied each house. The two lots were as near alike as it was possible to divide them. The result in brief, showed that the house with the glass window was considerably damper, the air less pure, the temperature only a degree and a half warmer on an average each week during the entire winter, and three times brighter and lighter than the house with the cloth window. In the glass window house four pullets died from various causes of debility, probably due to the breathing of stagnant air. The pullets in the cloth window laid considerably more eggs and there was no mortality.

A similar experiment was tried the previous winter in which fifteen cockerels were placed in each house instead of pullets. At the end of eight weeks it was found that the cockerels in the house with the glass window showed great debility, all but one having developed lopped combs, whereas, in the house with the cloth window only one had a lopped comb and all were in the best of health, and they made a much better gain in growth. The surprising thing, is the comparatively small amount of difference in the temperature of the two houses and the large amount of difference in the purity of the air and dryness. The small difference in temperature was due largely to the fact of a comparative small amount of air space which was kept warm by the hens. The pure air and dryness was due to the fact that the cloth permitted a quiet diffusion of air at all times, not rapidly enough to permit the escape of the heat so that the fowls suffered from the cold, but effectively enough so that the air was kept reasonably pure.

Fig. 2 shows the plotted curves of average temperature for each day. Also the average for day-time and night-time in this experiment just mentioned.

Fig. 3 represents two difficulties in the feeding and handling of the meat type of fowls. On the right hand we have the pendulus crop due to a lack of vitality and the breaking down of the tissues which loose their power to contract. There is no cure. The remedy is entirely in prevention. The other fowl has the broken down abdomen which is due to a condition of over fatness, most common in old fowls. This particular hen had about one pound of fat in her abdomen in one mass. Notwithstanding this condition of fatness which would have eventually resulted in death, this fowl was in good laying condition at the time she was killed, having an egg completely formed ready to be laid.

The next two slides, Figs. 4 and 5, show by contrast, a practical problem in the handling of large flocks of fowls economically. The labor bill is one of the largest on a poultry farm. Every plant should be arranged with a view to saving time as well as to the first original cost of the investment. Modern poultry keeping eliminates,

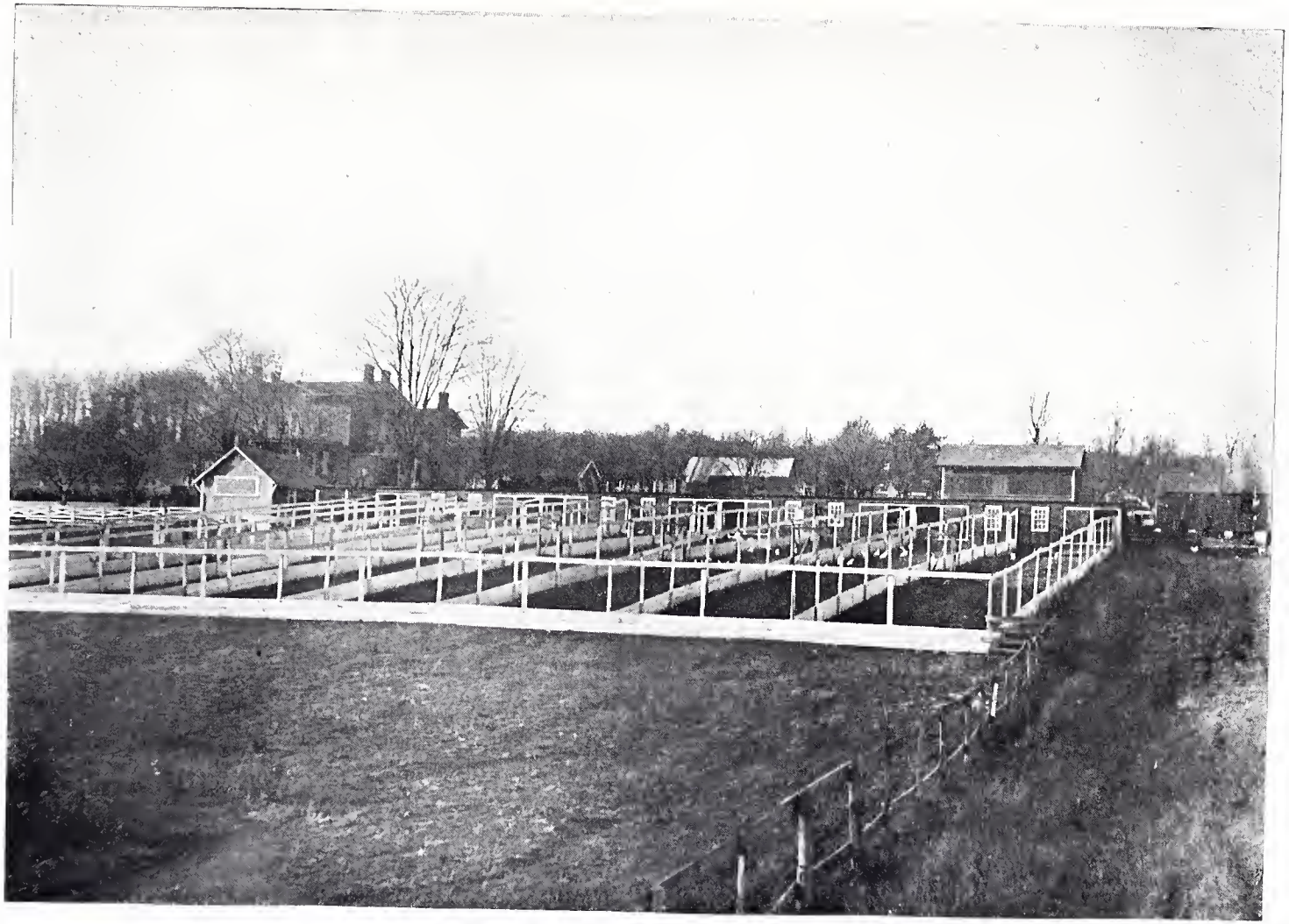


Fig. 5.

Fig. 6

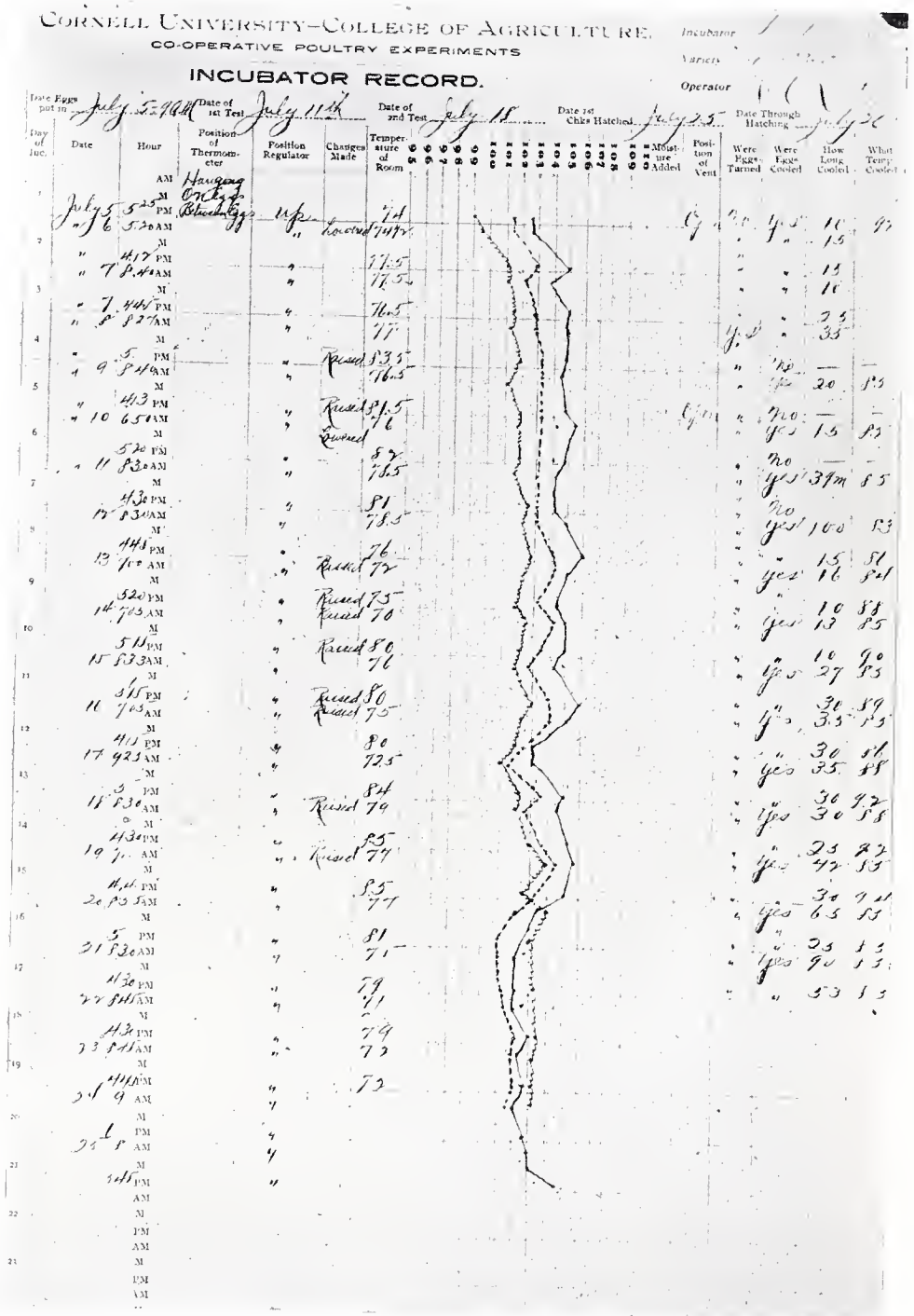

CORNELL UNIVERSITY—COLLEGE OF AGRICULTURE.
CO-OPERATIVE POULTRY EXPERIMENTS
INCUBATOR RECORD.
Incubator
Variety
Operator
Date Eggs put in
Date of 1st Test
Date of 2nd Test
Date 1st Chix Hatched
Date Through Hatching
Day of Inc.
Date
Hour
Position of Thermometer
Position Regulator
Changes Made
Temperature of Room
Moisture Added
Position of Vent
Were Eggs Turned
Were Eggs Cooled
How Long Cooled
What Temp. Cooled

Fig. 7.

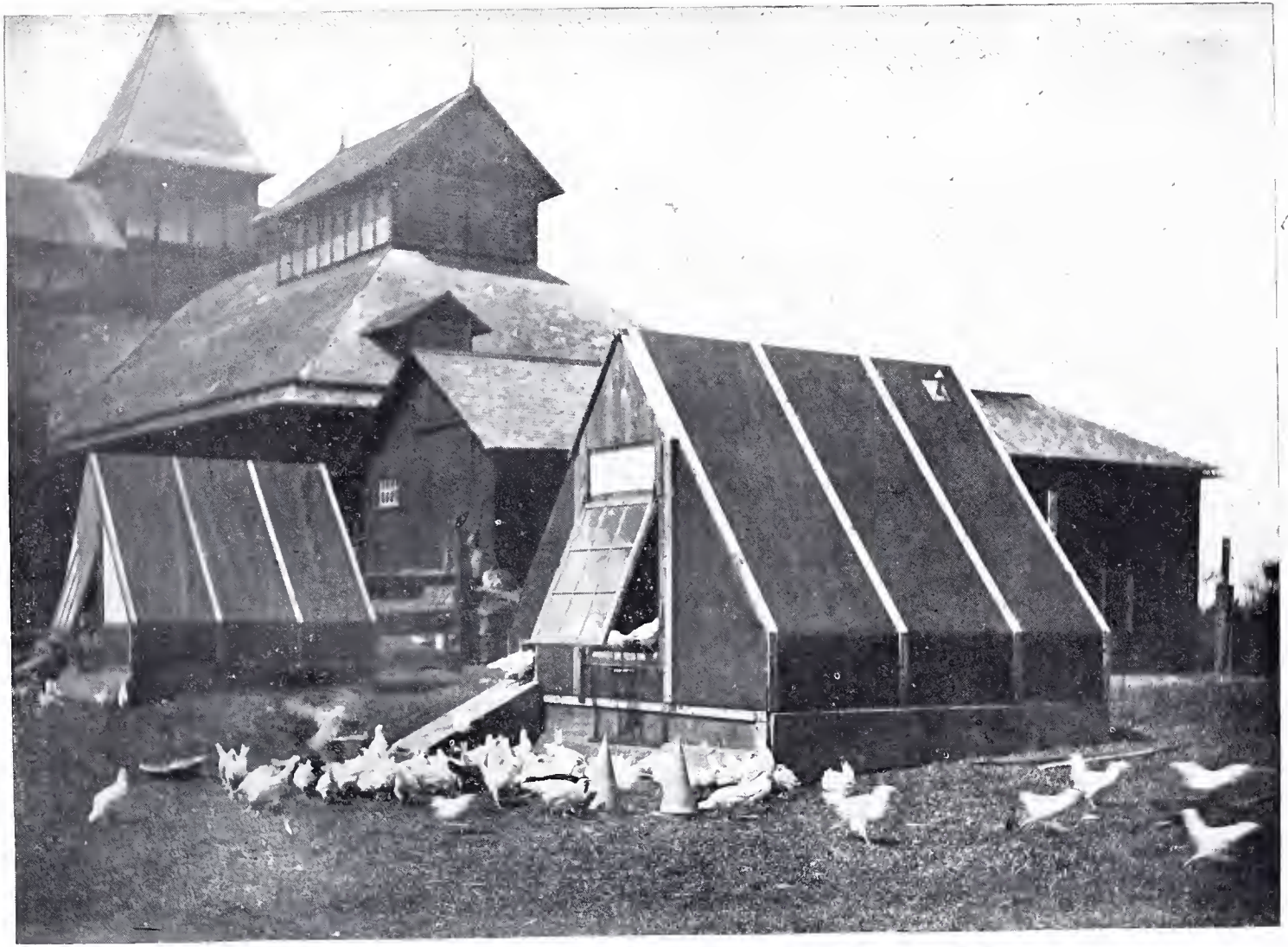


Fig. 8.

as far as possible, fences. Fig. 4 is a view of a Westchester county fruit and poultry farm where 1,500 White Leghorns are kept for egg production. These are divided, approximately, into three flocks of from four to six hundred each. These flocks are separated from each other by six foot wire fences and each is given two or three acres of orchard for range. The orchard furnishes shade, the intervals between the trees permits growth of grass for green food, and the fowls in return, furnish fertility to grow larger trees and better fruit. On this farm the fowls were originally fenced off into small flocks of 25 to 30 each, which made a tremendous outlay for fences and made it well nigh impossible to spray the trees effectively, the spray mixture quickly ruined the fences. Gradually these fences were taken out and it was found that all the various flocks returned to their own separate pens. It is well to remember that the biggest bump in a hen's head is the bump of location. Compare by contrast the expense of the yards, restricted runs, extra labor, and the lack of shade in the poultry plant shown in Fig. 5.

The problem which concerns all who operate incubators, is a proper temperature at which to operate the machines. We have tried a large number of experiments with the object in view of determining the best temperature to run the machines during each week of the hatch. We early discovered, that, in order to know the temperature which the eggs were receiving in a given machine, we must first decide how the thermometer should be placed. With this object in view, we ran a large number of hatches with different incubators, each of which contained three thermometers of different types. One was suspended with the bulb slightly above the surface of the eggs. One was placed with the bulb resting on fertile eggs. The other was placed on the tray with the bulb between the eggs. (See Fig. 6.) In each case these thermometers were placed precisely according to the instructions of the manufacturer. The actual result as shown by the reading of these thermometers during the entire hatch was startling, see Fig. 7, which is a reproduction of one of the incubator records which we keep when we operate each and all of our machines. The top line represents the temperature reading of the hanging thermometer, the middle line the thermometer resting on the eggs, the bottom line the thermometer that was between the eggs. It will readily be seen that there was a net difference between the reading of the hanging thermometer and the thermometer between the eggs of three to four degrees during the first two weeks of incubation which was gradually reduced during the last week. It will readily be seen also that if a given machine were to be run at 103 degrees by the hanging thermometer, the reading of the thermometer between the eggs would be 99 to 100 degrees. If, on the other hand, we were operating the incubator by the thermometer between the eggs at 103 degrees, the hanging thermometer would be running at 106 or 107 degrees. We have not yet determined just what temperature a machine should be run with each of these thermometers, but we have demonstrated that with certain machines the hanging thermometer did not give sufficient heat to get the chickens out until the 22nd or 23rd day, and some of them not at all, particularly where the eggs were cooled to any extent. We found, on the other hand, that where the temperature was run at 103 with the thermometer between the eggs, nearly

all of the chickens were killed during the first or second week of incubation, due to excessive heat, particularly where little cooling was given. We anticipate publishing a bulletin, in the near future, giving the results of our investigation as soon as we can make positive recommendations.

Of equal importance to the successful hatching of chickens is the method of brooding. There are four ways of brooding chickens. 1st, long house, with hot water pipes which is particularly intended for rearing chickens during the winter. 2nd, the out-door brooder holding 50 to 100 chickens, intended primarily for the smaller poultry farms. 3rd, the long house heated with individual in-door brooders which is a combination of the first and second types and has the advantage of saving labor, but has the disadvantage of serious loss by fire, and the difficulty of keeping the air pure. A fourth type, which in my opinion, is very much to be preferred, except, possibly, for winter broilers, is the colony house with an in-door brooder. (See Fig. 8.) The advantages of this system are that the houses are portable and can therefore be moved with ease from place to place in order to give chickens fresh ground and larger range. For instance, they can be grouped close to the buildings during early spring where they can be easily cared for and moved to the meadows, pastures, orchards, and corn fields later in the season. If these houses are built, as they should be, 8 feet square, they are large enough to be used the year around so that there is no idle capital invested. Such a house will accommodate fifteen fowls for egg production during the winter which makes a nice breeding pen. The house shown in the illustration is one which we designed at Cornell University, with the double object in view of the greatest economy of material with sufficient head room to do the work conveniently. It is built on runners, one foot high, which form the sills on two sides. This idea we got from Brother Orr and are very much pleased with it. The advantage being that the chickens have the benefit of a cool, shady place during hot weather and a quick retreat from the hawks. A point of no little importance is, that rats and other vermin cannot use it as a breeding and hiding place as they do with all types of brooder and colony houses which are close to the ground. This particular type of house, shown in the illustration, we heat with gasoline heaters especially designed for the purpose. Gasoline has two decided advantages over kerosene. First, it furnishes a much higher heat so that we can keep 200 chickens in a flock without crowding instead of 50. We therefore save about three-quarters the labor of feeding, watering and caring for the chickens. Second, the five gallon tank of gasoline, which is stored in the peak of the building, does not need to be refilled more than once in two or three weeks, depending upon the weather. There being no wick to trim, the heat system therefore requires scarcely any attention from one week to another. You will observe that the house is provided with both cloth and glass in front. The glass window furnishes warmth and sunshine necessary to the health and dryness and the cloth gives ventilation. Bulletins will be issued during the year, from the experiment station, giving details as to the construction of these houses and system of heating which will be free to all who apply for them.

The four slides which follow are the results of an effort to solve and show graphically some of the laws governing egg production.

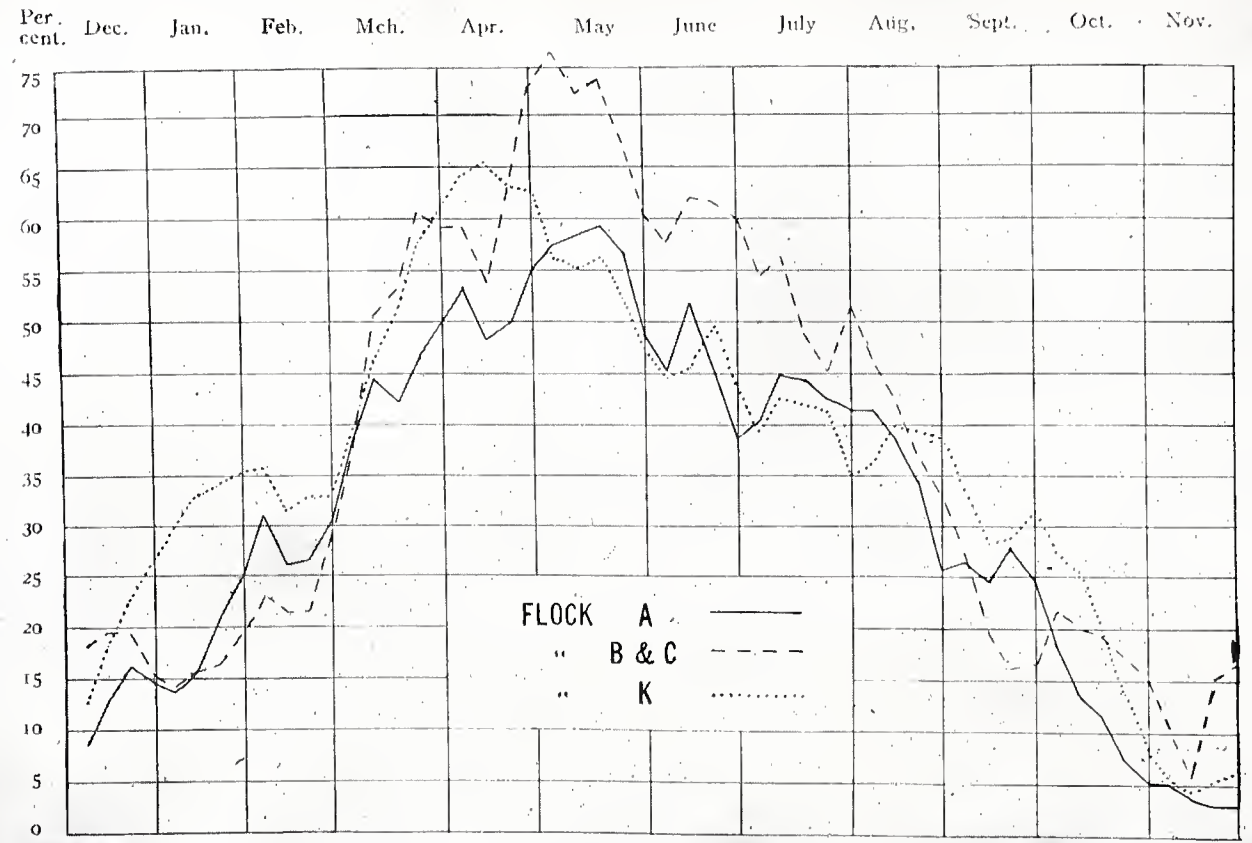
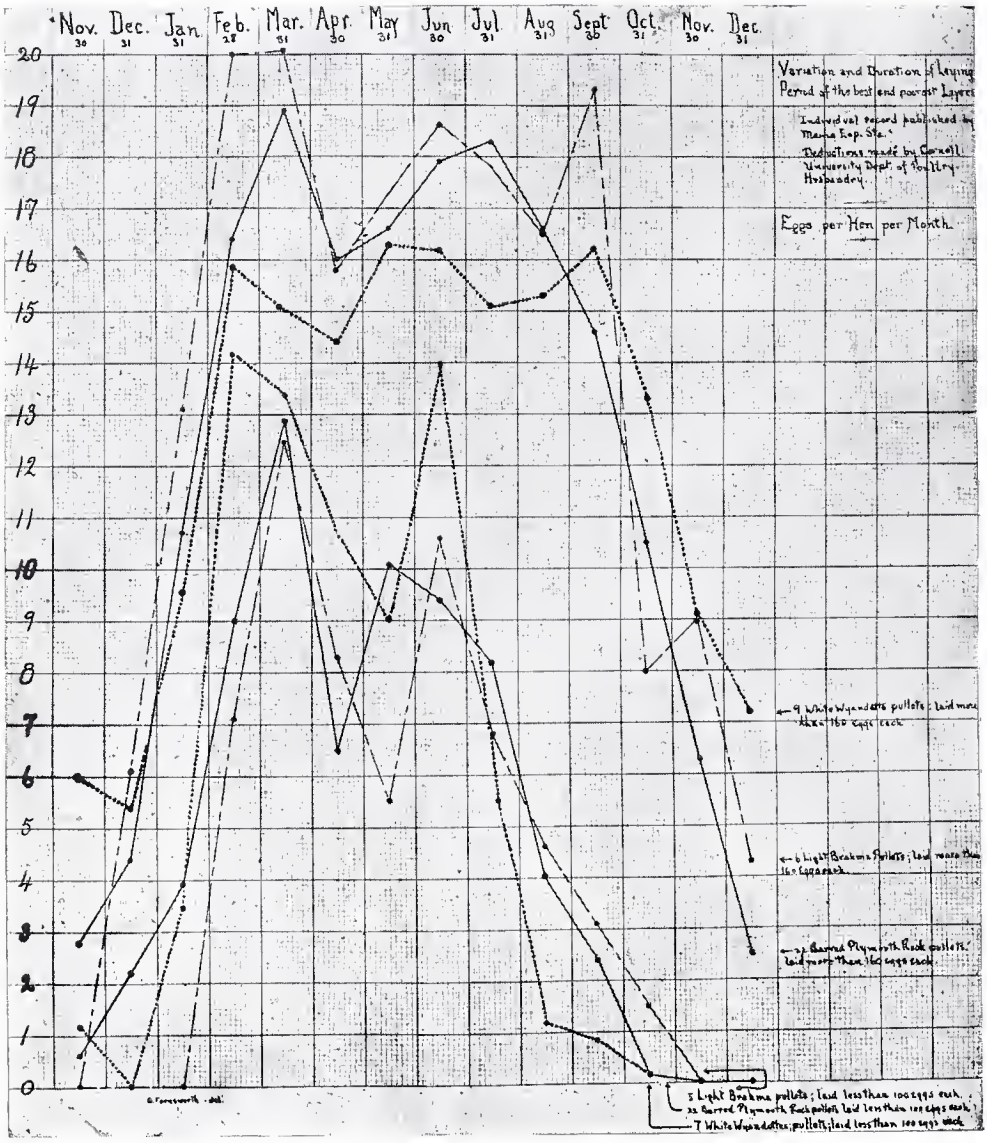



FIG. 204. *The percentage egg-production for each month of the year varies with great regularity one year with another, always being lowest during October, November and December, and highest during April, May and June. Observe the wonderful regularity in egg-production of three flocks as shown above.*

Fig. 9.


Nov. 30
Dec. 31
Jan. 31
Feb. 28
Mar. 31
Apr. 30
May 31
Jun. 30
Jul. 31
Aug. 31
Sept. 30
Oct. 31
Nov. 30
Dec. 31
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16
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3
2
1
0
Variation and Duration of Laying Period of the best and poorest Layers
Individual record published by Maine Exp. Sta.
Deductions made by Cornell University Dept. of Poultry Husbandry.
Eggs per Hen per Month.
← 9 White Wyandotte pullets; laid more than 150 eggs each
← 5 Light Brahma pullets; laid more than 150 eggs each
← 25 Barred Plymouth Rock pullets laid more than 150 eggs each
5 Light Brahma pullets; laid less than 100 eggs each.
25 Barred Plymouth Rock pullets laid less than 100 eggs each.
7 White Wyandotte pullets laid less than 100 eggs each.

Fig. 10.

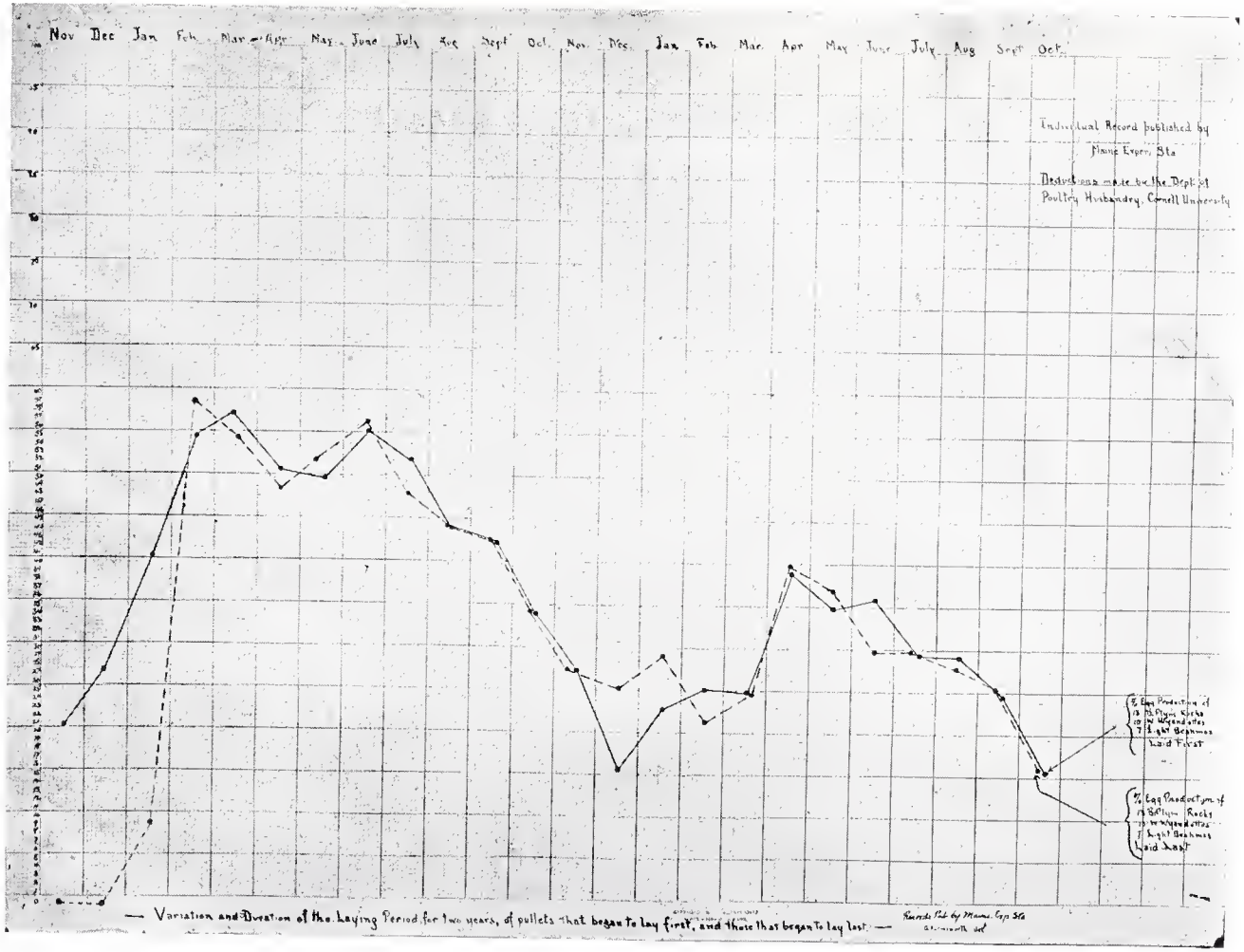

Nov Dec Jan Feb Mar Apr May June July Aug Sept Oct. Nov. Dec. Jan Feb Mar. Apr May June July Aug Sept Oct.
Individual Record published by
Maine Exper. Sta
Observations made by the Dept of
Poultry Husbandry, Cornell University
— Variation and Duration of the Laying Period for two years, of pullets that began to lay first, and those that began to lay last —

Fig. 11

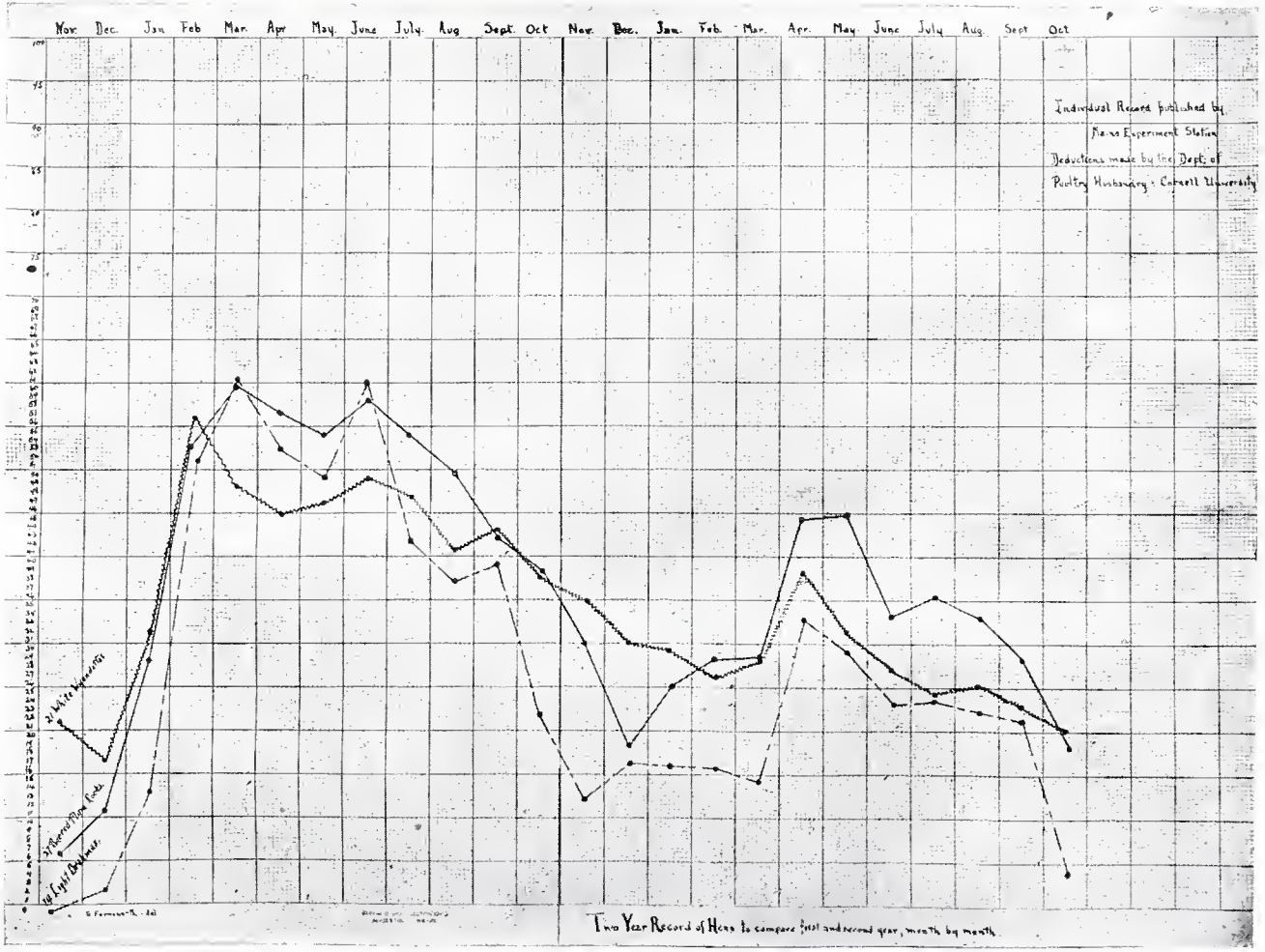

Nov. Dec. Jan. Feb. Mar. Apr. May. June. July. Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May. June. July. Aug. Sept. Oct.
Individual Record published by
Maine Experiment Station
Deductions made by the Dept. of
Poultry Husbandry - Cornell University
White Leghorns
Barred Plym. Rocks
Light Brahmas
Two Year Record of Hens to compare first and second year, month by month

Fig. 12.

Fig. 9 represents by plotted curves the percentage egg production of three large flocks of Leghorns on largely separate farms in the State of New York. Observe how closely the lines follow each other during each month of the year. Through this we deduct the law that egg production is governed by climatic conditions which has to do not only with the temperature, but the length of day and the amount of sunshine. The lowest per cent. productions, it will be seen, are in the months of October, November, December and January, the months of lowest temperature, shortest days, and least sunshine. The months of highest percentage production are April, May and June, months most favorable for egg production. The total height of these curves can be raised by increasing the per cent. of egg production through the use of early hatched pullets and by using pullets rather than hens.

Fig. 10 shows the variation in egg production for a year and two months between three flocks of poor layers which laid less than 100 eggs each a year. This flock consisted of 5 Light Brahma pullets, shown by the dash line, 22 Barred Plymouth Rocks, the solid line, and 7 White Wyandottes, the dotted line. The upper three lines represent the variation in egg production each month of 9 White Wyandottes, 6 Light Brahmas, and 22 Barred Plymouth Rock pullets, each of which laid over 160 eggs per year. You will observe that the hens which laid the least eggs did not begin to lay until January and February, whereas, the others were laying well in November and December. The poorer hens never reached a production of over 13 to 14 eggs per month per hen, whereas, the others continued for the entire spring, summer and fall, with a record of over 16 to 20 eggs per hen per month. You will see, also that the poorer hens got tired of their job and ceased business entirely the following October, while the better hens continued to lay from three to seven eggs a month during November and December.

A problem much discussed among poultrymen is, how long to keep fowls for profitable egg production. Fig. 11 shows graphical plotted curves of percentage production of certain flocks of hens through two full years of laying, as in the previous chart the production of three breeds are considered. It is worthy of note that they follow pretty closely, the same general trend of productivity of each month. Observe how much higher the curve of percentage production is with the pullets than it is with the hens. Especially compare September and October at the end of the first year with the same months at the end of their second year. These hens were all trap-nested as a means of determining the best from the poorest layers. It is also interesting to learn whether or not it is possible to select in any other ways than by trap nest, fowls which are to be the best producers. One of the ways in which we may judge of the fowls future productiveness, is by its early maturity and precocity. Occasionally this law is interfered with from the fact that too early maturity, while it indicates possibilities of productiveness, so weakens the fowl that it fails to meet its possibilities and our expectations because of exhausted vitality.

Fig. 12 is an effort to show actual results in percentage production of three flocks of pullets which began to lay first, and three flocks of the same variety and of similar age which were latest to begin to lay. The solid line represents those which laid first with

the record of from 20 to 28 per cent. production for the months of November and December, and 40 per cent. for January, whereas, the slowest to mature laid no eggs during November and December and only 9 per cent. during January. From that time on, for two years, they laid the same percentage, but those which began to lay last never overcame the handicap of the three months of their tardiness, November, December and January. Calculations and the deductions drawn as shown by the plotted curves were made by the writer from data found in bulletins published by the Maine State Experiment Station, giving the trap nest records for several years of a large number of hens.

Of equal importance to the production of good poultry and eggs is the problem of marketing the products at high prices. Good eggs and poultry are worthy of neat, attractive packages. Aside from producing good eggs, it is the easiest and most effective way to convince consumers that your product is better than the other fellow's. Appearances count for much in the selling of any article for human consumption. A well made, attractive, properly stenciled crate not only enables a person to charge a higher price because of attractiveness, but also insures the safe return of packages when shipped by express, due to the fact that they are not so likely to be overlooked and thrown off at the wrong station, also because they are so conspicuous that they are not likely to be taken by other shippers intentionally or through error.

The last two slides to be shown illustrate a piece of investigation which one of the students in poultry husbandry at Cornell has been doing the past year. To find out the difference in type of the different breeds of poultry particularly with a view of determining characteristic qualities for economical meat production, he photographed alive, dressed, and dissected, a large number of fowls of six different breeds, took accurate measurements and weights of the different joints, muscles, internal organs, etc. In addition to this, he made cross sections and longitudinal sections of various muscles from the different varieties studied. For the purpose of illustration, it will be sufficient for us to compare, by contrast, two of the principle breeds which he examined.

Fig. 13 shows the Barred Rock male and the White Leghorn male alive, dressed, and dissected. Observe the difference in type. The long narrow body of the Leghorn and the heavy, thick, blocky body of the Plymouth Rock. A close examination of the photograph will reveal many differences in the size of the various parts, some of which it may be well to mention. The intestines of the Rock measure 70.5 inches, while that of the Leghorn was only 55.9 inches. The caeca in the Rock measured 7.2 inches and in the Leghorn 6.6 inches. The percentage of the dressed fowl to the live weight in the case of the Rock was 90.50 per cent., while that of the Leghorn is 86.80 per cent. In like manner the percentage of the edible parts of the Rock is 75.49 per cent., and that of the Leghorn 66.55 per cent. Again the percentage of the waste parts of the Rock is only 13.42 per cent. in contrast to 16.45 in the Leghorn. Further comparisons are as follows:

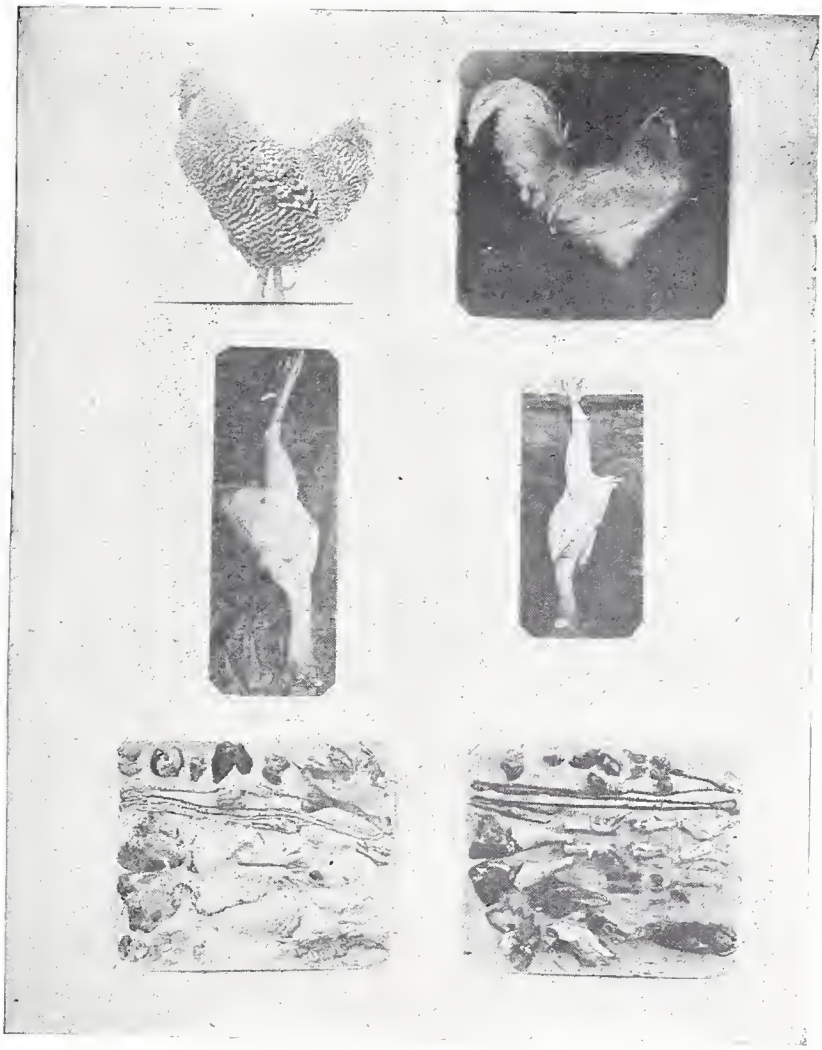


Fig. 13.

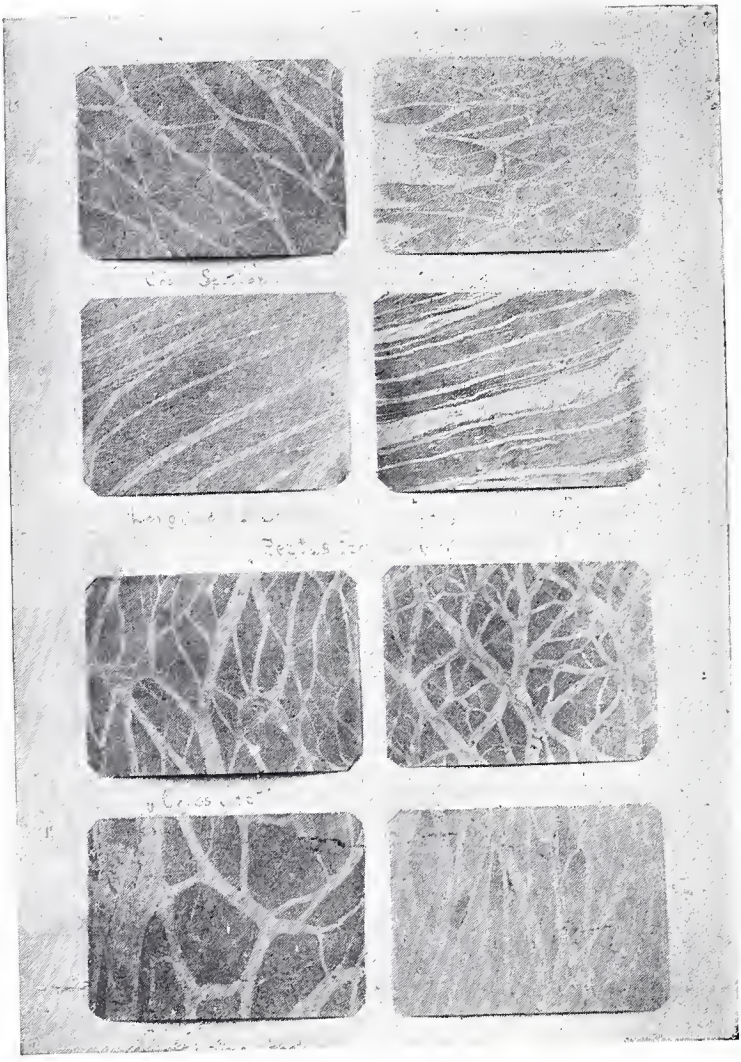


Fig. 14.

| Male. | B. P. R. | W. Leg. |
|---|---|---|
| Live fowl, | 100 | 100 |
| Feathers, | 5.16 | 8.15 |
| Blood, | 3.84 | 3.34 |
| Dressed fowl, | 90.50 | 86.80 |
| Edible parts, | 75.49 | 66.55 |
| R. arm, first joint, | 1.63 | 1.46 |
| R. arm, second joint, | 1.88 | 1.84 |
| L. arm, first joint, | 1.68 | 1.38 |
| L. arm, second joint, | 1.92 | 1.84 |
| R. leg, first joint, | 7.66 | 6.26 |
| R. leg, second joint, | 6.52 | 5.07 |
| L. leg, first joint, | 7.92 | 6.20 |
| L. leg, second joint, | 6.39 | 5.15 |
| Entire breast, | 16.50 | 15.96 |
| Left pectorals, | 7.53 | 6.80 |
| Back, rump and neck, | 19.80 | 17.25 |
| Heart, | .58 | .54 |
| Liver, | 1.54 | 1.50 |
| Gizzard, | 1.42 | 2.00 |
| Total waste parts, | 13.42 | 16.45 |
| Lungs, | .58 | .46 |
| Kidneys, | .45 | .65 |
| Head, | 2.45 | 5.23 |
| Shanks and toes, | 5.86 | 5.43 |
| Testicles, | .73 | .30 |
| Offal, | 4.66 | 5.89 |
| Lost weight, | 1.77 | 5.48 |

These tabulations seem to give a decided advantage, as an economical meat fowl, to the Barred Plymouth Rock.

Fig. 14 shows eight sections of the muscles; those on the left are from the Plymouth Rock, those on the right from the Leghorn. The first two on top are cross sections of the breast muscles. The next two are longitudinal sections of the same muscles. The next two are cross sections of the thigh. The next two are longitudinal sections of the thigh. It will be observed that the muscle, that is to say the lean meat of the Plymouth Rock, has a larger proportion than the Leghorn of the muscular fibres which contain the juicy, tender meat, and a much smaller proportion of the tough connective tissue. The latter being shown by the light portion and the former by the dark.

I regret that through lack of time it has been impossible to take up in detail, a discussion of the problems as thoroughly as it should have been done, and apparently there will be very little opportunity for informal questions and discussions, which to my mind, is one of the most important features of a meeting of this nature. I thank you for the opportunity of speaking to so large an audience and feel very grateful to Director Martin, and trust that I may some day have the pleasure of meeting you again, either in your own state or that you will visit us in New York, where I may have the pleasure of showing you what we, at Cornell University, are trying to do for the poultry interests of the country.

The CHAIR: The next subject for the evening is "Bee Keeping" (illustrated by lantern slides) by Prof. H. A. Surface, Economic Zoologist, Harrisburg, Pa.

Prof. Surface addressed the audience on the subject of Bee Culture, illustrating his remarks by lantern slides, showing the various processes of handling, and the methods of keeping bees, as follows:

# BEES AND HONEY.

By PROF. H. A. SURFACE, *State Zoologist, and Prof. of Zoology in the Penna. State College.*

I find "Bees and Honey" is a popular subject when viewed from the standpoint of the consumer, for there are very few persons indeed who do not enjoy this most delicious and healthful food; but from the standpoint of the producer it is not so popular in this State, as we do not have nearly as many bee-keepers as there should be to supply the honey that is desired for use.

I do not understand why there is not more Honey produced in this great State of Pennsylvania, which has flowers of great variety, producing nectar for the most excellent honey, almost all seasons of the year, from early spring to late fall, unless it be that our citizens have not learned the real art and science of bee-keeping. In our State, Nature has done her work, and is only waiting mankind to do his to make this State literally one that is "flowing with milk and honey."

Since having taken up this subject in earnest, and studied it from a printed and scientific source as well as by practical means, I have become convinced that there is no subject along agricultural lines that engages the attention of mankind concerning which the majority of people know so little and of which there is so much to learn in order to be successful. At one time a man who kept a few bees was called a "bee-keeper." Perhaps he was. To-day a man who produces honey is known as a Bee-culturist or Apiculturist, just as we have Agriculturists and Horticulturists, and he must know concerning his business fully as much as his brothers know of their business, respectively. When he gains a practical knowledge of his profession it is certain to yield him greater returns for his comparatively small outlay than if he should engage in any other side line of agriculture. Concerning the profits from Apiculture, when run in a practical way, there can be no possible doubt, but it is to the farmer who wishes to produce enough honey for his own family and his immediate friends that I wish to speak.

As President of the Pennsylvania State Bee-Keepers' Association, I have been asked by Director Martin to prepare an address on "Bee-Keeping" that might help the farmers of this State. To do this I have prepared many slides for this occasion and shall use them as I speak.

The bee-keeper who is to succeed should know the facts of such subjects, as the honey-producing plants, their date of appearance, the yield and abundance, the general structures, habits and life-history of the honey-bees, the methods of handling bees with safety, the manipulation of them to obtain the best results, modern hives, the best methods of changing from the old to the modern hives, the use of foundation or sheets of wax where the comb is to be found. methods of getting rid of the drones where not wanted and of producing drones where needed, the methods of producing queens or buying queens of a desired strain or race and introducing them into the hive, and getting rid of those already there, clipping the wings of the queen and thus prevent loss of bees by swarming, dividing

the hives or colonies and entirely preventing swarming, moving bees from one place to another, wintering them safely and cheaply, feeding them at such time of the year as is necessary, getting the best results from using pound sections to produce the comb honey in the neatest possible way, or extracting and producing the liquid honey, the method of marketing honey in the most attractive and successful manner, the enemies and diseases of bees, and should recognize these evils and know how to overcome them. There is much more to be said about bee-keeping but this is a synopsis of the points to which I wish to call your attention in this limited address.

What is honey? Honey is defined by the Pure Food Standard as being the Nectar of Flowers, or the saccharine exudations of plants, gathered, transformed and stored by the honey-bees. Thus it can be seen that if a person should attempt to feed his bees with glucose, sugar, or syrup of any kind, and the bees should store it and cap it like honey, this substance would not be the regular article, and any one could be prosecuted for selling adulterated honey if he should sell that which had ben adulterated by this method. At this time I wish also to take the opportunity to say that there is no such thing as artificial comb-honey and comb-honey can not be made artificially. The National Bee-Keepers' Association has a standing offer of a forfeit of $2,000 to any person who will give them two pounds of comb honey so made that it is not readily detected. I am a member of their Publication Committee, and it is our duty to dissiminate such facts as these, as it is now quite generally but wrongly supposed that honey is generally adulterated by all kinds of substances.

Honey-producing Plants.—The bee-keepers should know the honey-producing plants of his region, and their dates of yield, in order that he can build up his colonies and get them as strong as possible at the beginning of the important flow of honey, and also in order that he can be prepared for a heavy crop by having all apparatus and parts of the hives ready to be put on or changed at any time, without a moment's delay when the bees have filled the super or storage receptacle. The loss of only a few days during the height of the honey flow often means swarming fever and the loss of a swarm or more. Among the first plants in spring we have all the Maples, which do not yield a great deal of honey, but their pollen is very important in feeding the young bees and stimulating the queens to egg-laying. The Box Elder is likewise an early pollen-producing plant, and the willows, especially the Pussy Willow, are important in this regard. Where these are found in abundance the bees will increase rapidly and will be in good order by the time for the fruit blossoms. However, the blossoms of the fruits, such as peach, plum, cherry, apple and pear are generally of the greatest value in building up a colony and stimulating the rapid egg-laying of the queen, and thus putting them in good shape for the white clover, which is of greatest importance in our country. It is true that for a short time we have a trémendous flow of fine white honey from the black locust or yellow locust, as it is also called, as I know that this spring some colonies stored as much as twenty pounds of honey in one week.

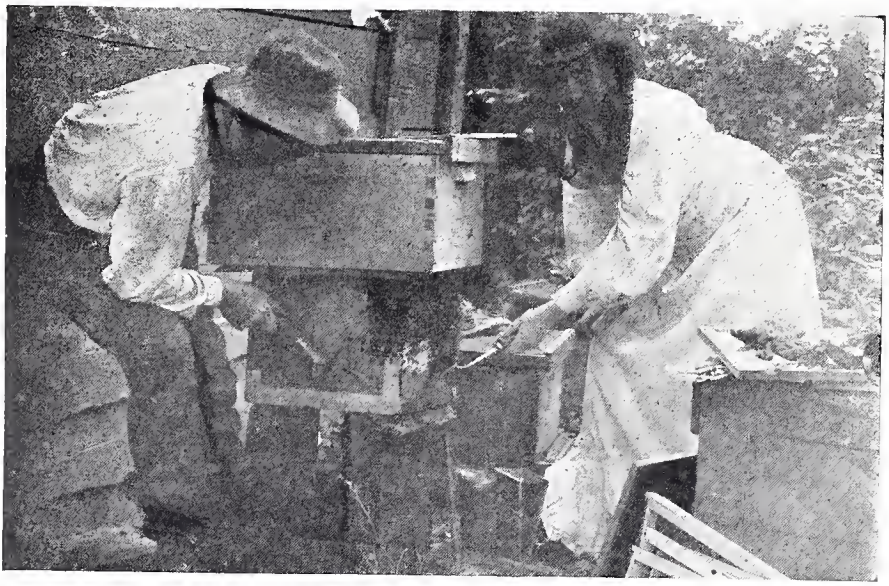
Where bass-wood is yet to be found in sufficient quantities, this is one of the most important honey-producing plants of our State, but it has been destroyed to such extent that it is not generally re-

garded as important in honey-producing at the present time. Sumac and the late maples are of some value, but there is no plant like the white clover. Alsike, where grown, is valued for honey. While it is not generally believed in the East that Alfalfa is a nectar-producing plant, we have recently found Honey-bees, Bumble-bees, Butterflies and Skippers on alfalfa flowers, and we have seen it yield well developed seeds in Cumberland county. It is our opinion that insects would not visit it if it were not nectar-producing. It is one of the most valuable honey-producing plants in the western part of the United States.

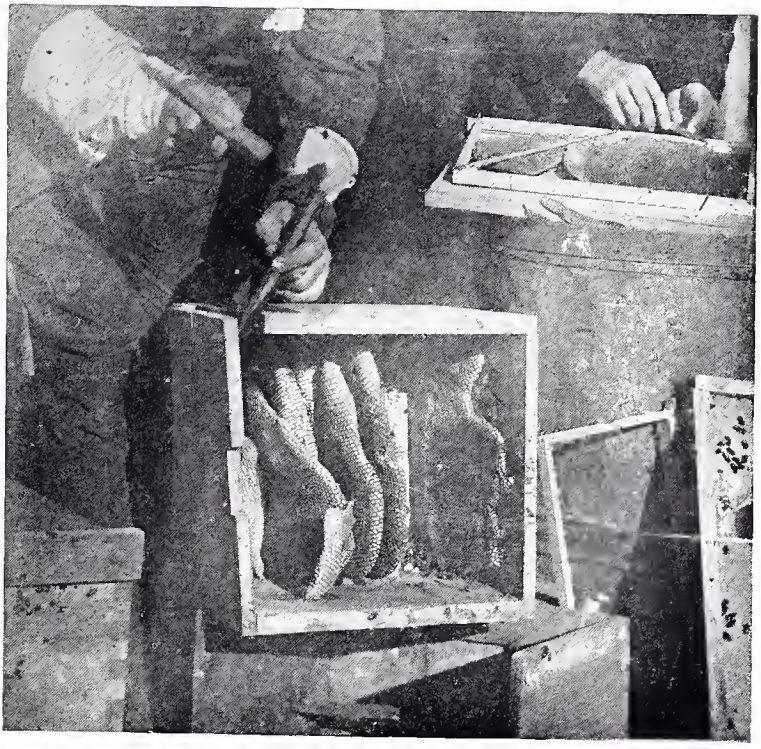
After the white clover comes the Mellilotus or Sweet Clover, of which we have two varieties, the Yellow which is early, and the White, which is later, and is prolonged through July into August. In rich damp valleys this is a most valuable honey-producing plant, while on the hillsides and along roads the catnip is often found in such abundance that it is an important factor in producing nectar The various mints are also important in midsummer and later. Later in the season we have the far-famed buckwheat with its dark well flavored honey, which, where grown, makes it possible for the bee-keeper to remove all the white clover honey from the hive and the bees will make their entire winter store from the buckwheat. In the southeastern part of this State, especially in the low lands and along streams, there is a plant known as the Yellow Plant or Yellow Autumn Flower. When the seed is mature it is known as the Spanish-needle (Bidens). This is a valuable plant and yields an abundance of honey for the winter storage. While red clover is grown in this State, the bumble-bees make the greatest use of it, for the honey-bees do not usually work upon it unless the flowers are short, as on sandy soil or during a dry season. While Red Clover Honey Bees are advertised by some dealers, they are nothing more than a good grade of Italians and a great many of them are no better than some of the other strains.

The inhabitants of a hive consist of (a) the queen, who is the egg-layer or the mother of the entire colony, (b) a few or many drones, which are the males and which are present only during certain parts of the year, and (c) a great many workers, which are rudimentary females, and which may develope the function to lay eggs if they be long deprived of a queen. However, their eggs, not being fertilized, always hatch drones. When they are preparing to swarm or when the queen dies, is lost or becomes infirm from age or disease, the bees construct queen cells and feed the larval bees with a secretion from their heads, known as royal jelly, until the young queens are full grown. A young queen then comes forth and takes the place of the old queen. This displacing a worn-out queen by a young one is known to bee-keepers as superseding.

Swarming is nothing more than the old queen leading most of the old workers in flight to a new place and establishing a colony. The new queens are left in the hive, and the strongest one kills all the others. If at any time the queen be removed or lost by any means, the bees immediately proceed to feed royal jelly to some of the larvæ that are less than three days of age and continue to feed them abundantly with this substance until full grown, when they are enclosed in their cells a few days and then emerge as queens. The first one out of the cell bites open the other queen cells and kills



1. First Step in Transferring to New Hive. Driving Bees up from Old Hive into New. Scene in Apiary of Prof. H. A. Surface, State College, Pa.



2. Second Step in Transferring a Colony of Bees from an Old Hive into New. Splitting away the Side of the Old Hive Parallel with the Sheets of Comb. Photographed by H. A. Surface, in his own Apiary.

3. Third Step in Transferring Bees. Fastening Combs with Wooden Strips into new Frames for Modern Hives. Photo. of Prof. H. A. Surface in his Experimental Apiary, at Camp Hill, Cumberland Co., Pa.

the inhabitant of each. All young bees are fed on this royal jelly, which is a secretion from glands in the head of the workers, only during the first three days of their lives, after which they are fed on thin honey and pollen or bee bread, and then they develop into workers instead of queens, as they would have done if fed differently. Bees do not make queens except when their queen is lost or infirm, or about to swarm.

The structure of the bee is important, as the protection of the bee-keeper depends on it. The bee has two kinds of eyes, one known as the ocellus or simple eye, which is a large single lens, three of which are placed in the head. The other is the compound eye, which consists of a great number of lenses placed together to form one eye at each side of the head. It is known that bees have very accurate far sight and fine near sight, and it is thought that one of these eyes is for seeing objects at a great distance and the other for seeing them at very close range. The bee keeper takes advantage of this and can stand fairly near the hive and is not attacked, while objects twenty feet away, or even more, receive the attention of the angry bees. The tongue of a honey-bee is generally about one-fourth ($\frac{1}{4}$) inch long. While an effort has been made to breed longer tongued bees in order that they may reach the bottom of the red clover tubes, this has not been accomplished as yet. The sting of the bee is attached to a poison sack, and is also provided with muscles to force it into objects. Owing to the backward barbs on its tip it is frequently left behind and causes the death of the owner. If the sting be removed immediately after it is inserted, but little poison passes through it, but if it be left for some time it continues to go deeper into the skin of the victim, and the muscles continue to work and force the poison through the tube and cause considerable pain. In removing the sting the operator should be careful not to grasp and squeeze the sting and thus force more poison into the flesh, but should scrape it away so that the poison will not be squeezed through the hollow dart from the poison sack. Applications of ammonia, soda and water, essence of lemon, or other substances will relieve the pain of the sting, but the bee-keeper soon becomes almost immune to stings and works with the bees with bare hands without fear of being stung occasionally.

The legs of the worker bees are provided with bags for carrying the pollen, which becomes the bread of the young. In their digestive tract they have the honey sack, which is not the stomach, where they carry the nectar which they gather and make it into honey by the addition of a little formic acid. When the bees reach the cells in which the honey is to be stored they disgorge the precious burdens through their mouths.

By a peculiar arrangement of the reproductive organs, the fertilized queen bee is able to lay worker eggs or drone eggs at will. This is because the eggs which are fertilized hatch into queens and workers, and those which are not fertilized produce only drones. The queen mates but once in her lifetime, when flying high in the air, and the fertilizing element is retained in a small sack at the side of the duct of the ovary. When laying the egg, a small portion of this is permitted to reach each of the worker eggs, but in laying the drone eggs this is held tightly in the closed sack.

The queen commences to lay eggs in the middle of the comb, near

the centre of the hive. She does this with system, passing around the comb in widening circles from the center toward the outside. These eggs hatch in three days, and if they be made queens they develop into the winged queen and mature in about 15 days. The workers require 21 days and the drones take about 24 days to develop. The number of eggs may vary from 800 to 3,000 per day and depends to a great extent upon the number of bees in the colony to care for the young and the amount of honey coming in. During a time of scarcity there are very few eggs laid and during a heavy honey flow there are a great many if the queen can then find room for them.

It is possible to take advantage of this knowledge and build up a colony by artificial feeding at a time shortly previous to a heavy honey flow, in order to get the benefits of a strong colony at such time. By feeding my bees upon syrup made with granulated sugar (1 part) and water (2 parts), I have induced egg-laying and brood-rearing to such an extent that the hives were full of bees at the height of the fruit season and an immense amount of honey was stored before most of the other bees commenced to do much work.

The most essential instrument in working with the bees is a smoker and I would as soon think of making a practice of driving horses without lines as of working with bees without a smoker. It immediately surpresses all insubordinate bees and lets them know they have a true master. However, bees should not be smoked indiscriminately, at all times, or to a point of suffocation, as even a small puff keeps them in a hive for sometime and consequently reduces their services as honey-gatherers for that length of time. Some persons will go among their bees frequently and handle them with neither veil or gloves and not be injured by them, while others are badly stung and say they can not keep bees at all. We must remember there are three things which arouse the anger of bees, and when they become fully infuriated they become utterly indifferent to their own death or suffering: One of these is a comparatively light tapping or jarring of the hive; another is the breath blown gently on them and also offensive odors from the operator, and the third is the sight of fur or hair. The explanation of this is that for centuries the home of the bees has been in trees and their greatest enemies were the bears and such other animals as could climb the trees. The slight scratching of the bears on the bark of the trees as they climbed was sufficient to apprise the bees of the approach of their enemy, and as a consequence this instinct or inherited fear and quick anger under such conditions is retained to-day. Another thing, the bear approached the hole in which the bees lived and breathed in it and they thus became aware of their enemy and would make an attempt to dislodge it. In this is found the reason for the anger of the bees when a warm breath blown gently upon them. The anger from seeing hair or fur is a relic of the time when their greatest enemies were the hairy animals. Consequently, when bee-keepers go into the bee yard, especially ladies, without a hat or veil it is only to be expected that the bees will be angered and that they will be stung. Likewise it is a common belief that in order to hive bees with the best success the owner or operator should wash himself and change his clothes. This probably has for its basis the fact that bees are offended at certain odors,

as mentioned before. However, the smoker will immediately quell such insubordination, if taken in time, and as said before, this is the most essential implement for the person who keeps bees and produces honey.

It is also necessary to have modern hives with movable frames, as it is impossible to have success with old-fashioned box hives or gums. To use a hive that can be opened and examined in every part at will is as necessary in modern bee culture as it is to plant corn in rows for the modern cultivation of the corn, and we would as soon try to cultivate a crop of miscellaneously scattered corn and produce first class results as we would try to get the best results in bee-keeping by using the old box hives. With the old style hives it is impossible to know when the bees in the hive are diseased and apply remedies, or learn when they have enemies (worms) and remove them, or to Italianize or introduce a new queen, or to find the queen and clip her wings or remove her, or give them the care that is necessary for intelligent bee culture, or to produce either comb honey in sections or extracted honey.

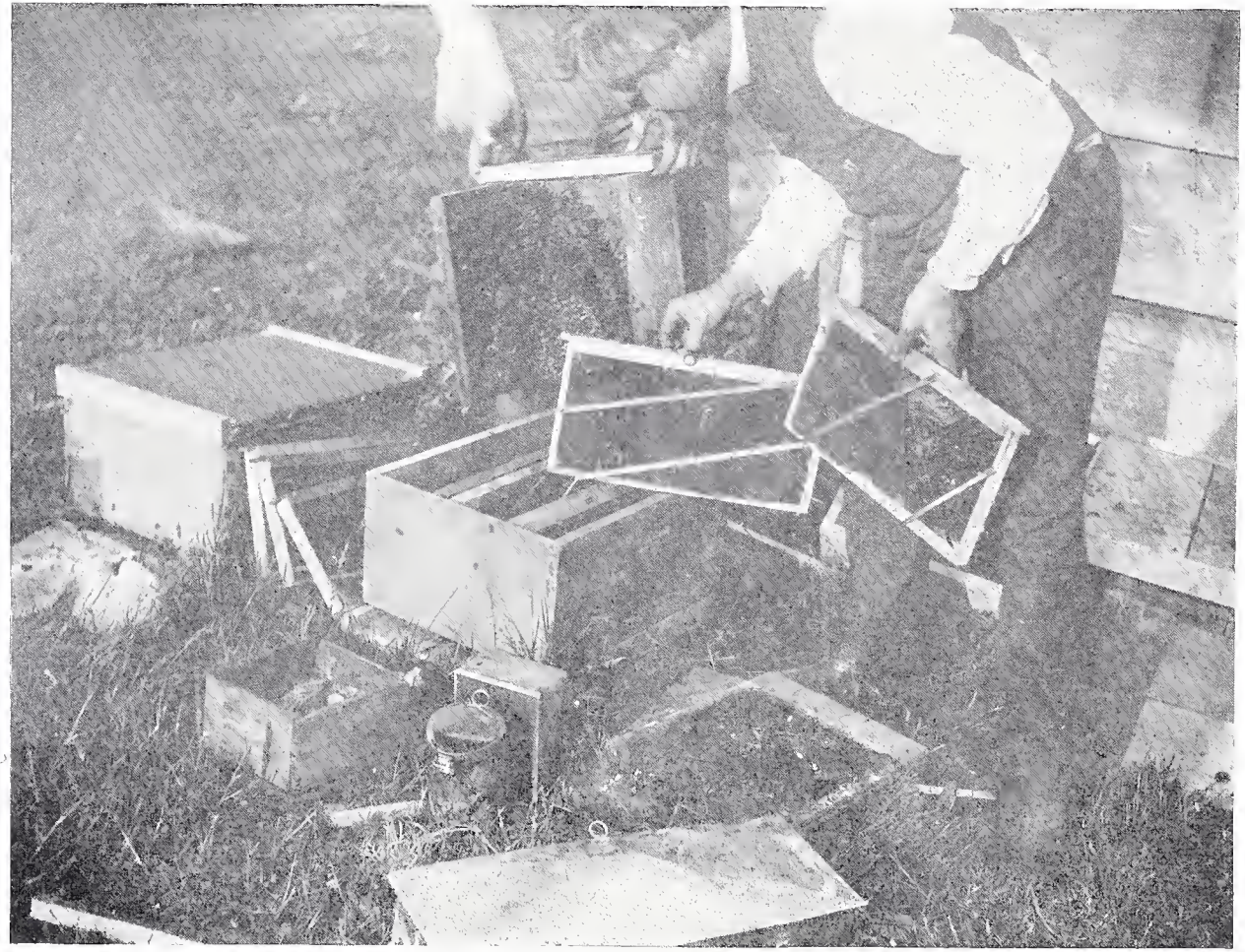
There are many styles of modern hives, but they all agree in having movable frames, suspended at the top or ends, and which can be taken out separately and at will. For general purposes in honey production, we regard the 10-frame dove-tail hive, with style of frame known as the Langstroth, as the best that can be used. With such a hive one should have the super or top fitted with honey sections one inch thick, four inches wide and five inches high. These, when fairly full, will hold just about a pound each. Each of these supers will contain 28 such sections. These hives can be ordered in the flat and nailed together by the receiver, or if he dosen't know how to do this he can order one hive nailed together as a sample and the rest in the flat, and he can then put them together. It is necessary that all parts fit, to the fraction of an inch, and when all the hives are the same size the frames can be changed from one hive to another. We consider it so very important that all the hives in one apiary be of the same size and make, that we have recently thrown away 18 hives of the movable frame type because they were not the exact size and shape as the rest in our regular apairy. Unless one has lumber, tools and time in abundance he can certainly buy his hives ready-cut much cheaper than he can make them himself. I would not, under any circumstances, advise the use of different size and shape hives in the same apiary. This is because of the fact that the bee-keeper often desires to change the frames from one hive to another, and he can not do this without uniformity. When the hives with the movable frames are used, and the frames are filled with straight comb or sheets of wax as a foundation, there is no danger of the bees building crooked comb. However, it is quite necessary that the hives be kept full of frames, and these should be kept so close together that there is just the distance of one bee's-space between (three-eighth inch) them. When the frames stand further apart the combs are quite liable to be irregular in thickness and they will no longer be interchangeable.

In working with bees at any time it is best to wear a veil. The one who works without a veil is fool hardy, but he does not need to work with gloves or hand-protectors, as this is somewhat of an impediment. With the smoker he should puff lightly into the

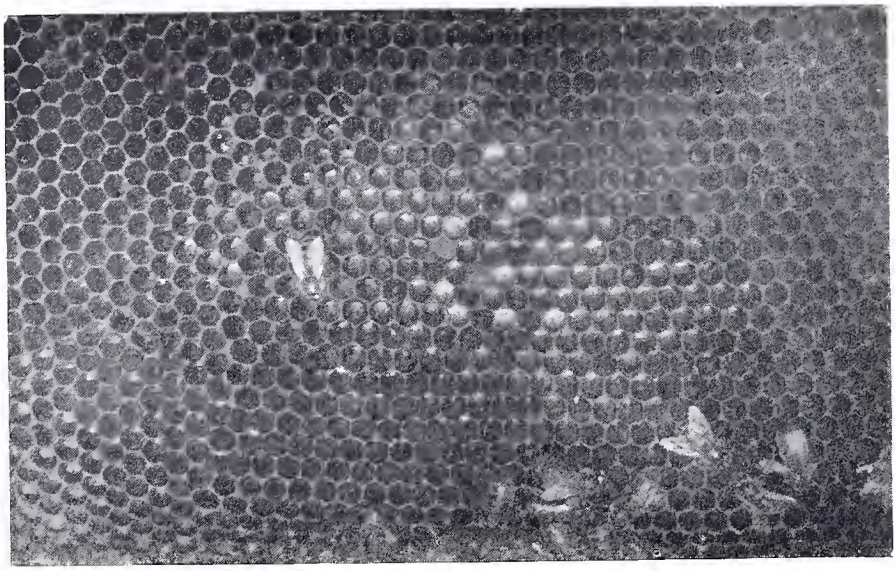
entrance of the hive, then pry off the cover just enough to allow the smoke to go in but not enough to let the bees out, puff some smoke under the cover and then lift it off, shaking the bees from it near the entrance of the hive. Then pry a frame at one side enough to loosen it and lift it out, shake the bees in front of the hive and stand the frame down against the outside of the hive or at the rear, near at hand. Remember to take out the outer frame first. If it be held fast by burr comb cut it loose with a long bread knife. After the first frame has been removed it is easy to pry aside the other frames, and they can be raised and examined for eggs, drone comb, queens, queen cells, moths, and disease. If worker eggs be found the bee-keeper knows that the hive has a queen and she has been laying within three days. If no eggs be found and queen cells be present he will know that the queen has been lost, probably in the last manipulation, and that the bees are engaged in rearing a new queen. He can then, if he wish, remove all the young bees ("worms" or larvæ) from the queen cells and in their place insert those of some strain or variety which he may wish the new queen to be. In this way he can produce his own queens without trouble or expense.

It is very important for the bee-keeper to be able to remove the drone comb when he doesn't want it and thus prevent considerable loss by these lazy fellows consuming good honey. In this way he can also prevent the drones from appearing in certain hives that he may not wish to propagate in his apairy. On the other hand, by inserting drone comb into frames where he may wish the drones he can thus propagate the good qualities of his best hives. The bee-keeper should select for propagation only those which have yielded the largest amount of honey, as it is not at all advisable to rear queens from a poor hive or queen. It is best to remove the poor queen from the hive and introduce a better one. At the end of four or five days cut out all the queen cells that are found in the frames in the queenless hive and out of the desired hive remove a frame with the eggs and insert in the poor hive. From these new queens will be reared. The detailed method of rearing queens is so complicated that we cannot discuss the subject here but would simply show how it is possible. In looking over the frames the evidences of diseases of bees can be found and the proper remedies applied, the larvæ of the bee moth can be detected and removed, the drone comb can be cut out or inserted as desired, and queen cells can be cut out or can be inserted them from other hives. For example, if I have several hives which are not yielding as much as I think they should I can start one of them to making queen cells by the methods mentioned, and when these queen cells are completed and capped they will be about the size and shape of a peanut. I then remove each queen from the hives I wish to re-queen, cut a queen cell from the desirable hive, and set it in the comb of the hive from which a poor queen has been removed. In this way a queenless colony is started to rearing queens for several hives, and I have no trouble in transferring the queen cells with the new queens in them and re-queening each colony.

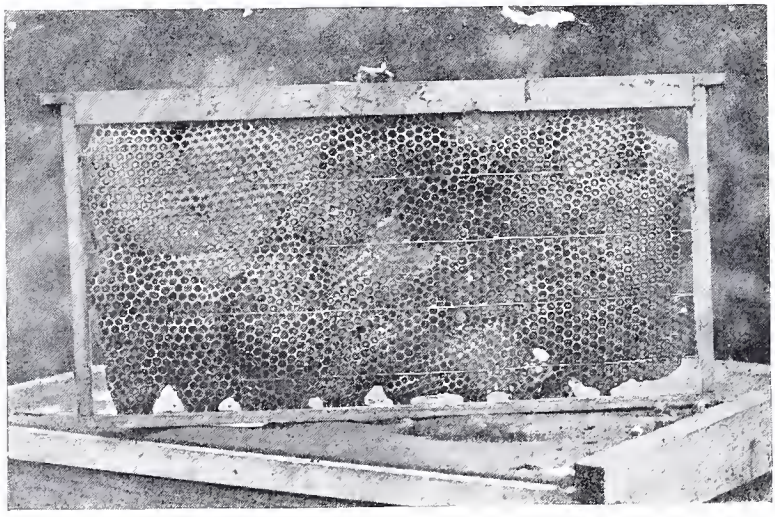
With the modern frame hives there is no difficulty in introducing a new queen of a different race. I have recently had bees sent from the different states in the Union, and in fact from across the



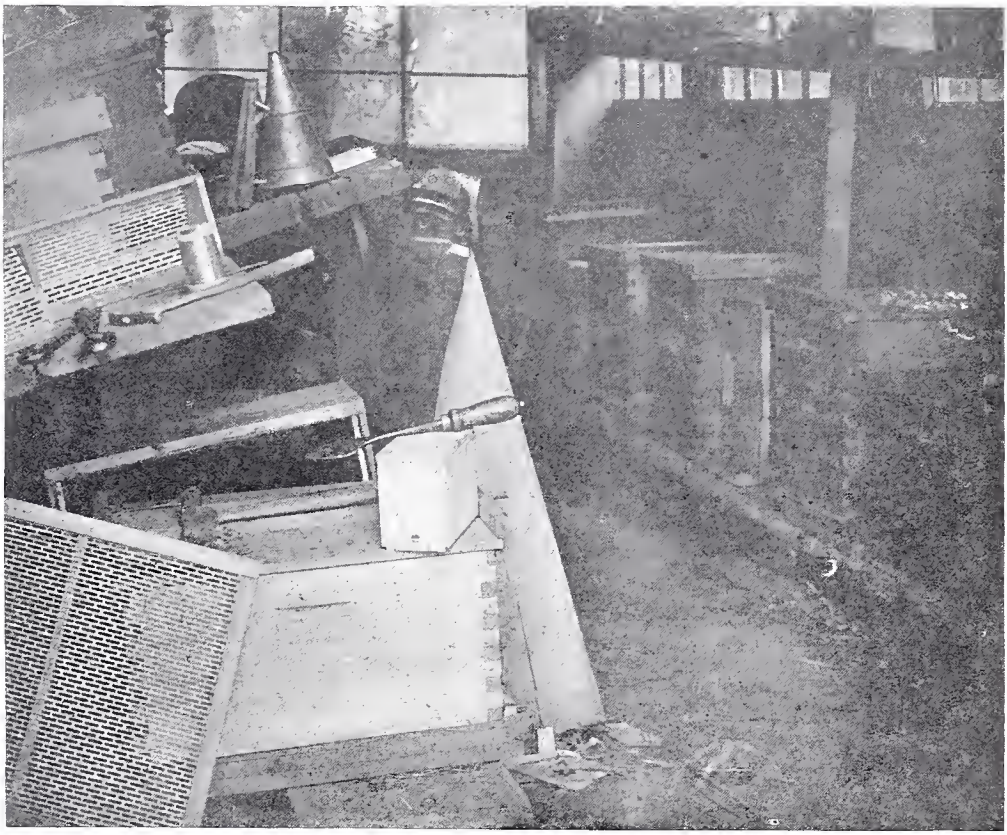
4. Fourth Step in Transferring Bees—Placing Newly Filled Frames and Shaking Remaining Bees into new Hive. Photo. of Prof. H. A. Surface and Assistant in Experiment Apiary at Camp Hill, Cumberland Co., Pa.



5. Comb in Center of a Frame Showing Young Bees or Larvæ just Hatched and Surrounded with "Bee Milk" for Food, and also Eggs (White Specks) in Surrounding Cells. Photo. by H. A. Surface.



6. Full Frame of Drone Comb, Made by Placing in one Frame Several Small Pieces of Drone Comb Cut from other Hives. Used for Obtaining Caucasian Drones for Mating Purposes. Photo. by H. A. Surface, in his Apiary.



7. Interior View of Bee House, at Former Apiary of Prof. H. A. Surface, at State College, Pa., Showing Row of Hives (at right, below), Shelf Above Same, and Bee-Keeping Appliances (at left). Photo. by H. A. Surface.

8. The Gentle Caucasian Bees. Hive Opened Without Smoke, and Frames of Honey Comb with Living Bees Held in the Bare Hands of Novices in Bee-keeping. Scene at Meeting of Students and Grangers, at Apiary of Prof. H. A. Surface, State College, Pa.

ocean. They come by mail in cages, and all that is necessary is to open the cages and follow introduction methods in some good book on bee-keeping and introduce them to the queenless colony. Have the opening through which the queen would crawl stopped with bee sugar, which is honey and powdered sugar mixed together. While the bees are eating this away to release the imported queen, they are becoming acquainted with her, and in a day or two will accept her as queen. Of course the hives must be made queenless before it is wished to introduce a new queen. This of course can not be done with an old style hive where the operator could not look through the hive and find the old queen. We take this opportunity to denounce against the so called observation hives, which are frame hives with glass on all sides. They are expensive and alluring, and while the outer side of each of the frames that are on the sides can easily be observed, one can not see what is taking place in the interior of the hive and can not see the queen nor the young bees without taking out the frames, as with the ordinary frame hives.

It is easy to transfer bees from an old style hive to a new one. Have the smoker ready for use. The first step is to smoke the bees in the old hive, open a hole at the top so they can pass up through it, set the new hive on top of the old one, and by pounding the old one and occasionally puffing smoke into the same, drive the bees from the old hive into the new. As soon as the queen comes out there will be a grand rush into the new apartment in the upper story. Remove the cross sticks, if any, and split off the side of the old hive that is parallel to the sheets of comb within it, and also split off the bottom or pound it off with a hammer. With a large knife like a bread knife cut out the sheets of comb with honey brood. Lay it on a board and using one of the new frames as a pattern cut the comb to fit the frame as closely as possible. Fasten it in with thin sticks, as shown in the illustration, or with strong rubber bands. If the rubber bands are used they must be very strong, to prevent lopping over at the top. The frames are then put into the new hives. If the comb is uneven it should be cut so as to fit and permit all the frames to be put parallel in the hive. Avoid crushing the bees at all times and especially now, as it is hard to tell where the queen is and if she be killed the most valuable part of the hive is lost.

I have had my students and visitors at State College help me in this work with safety, and it can be done by any one who is willing to undertake it. In fastening the comb in the frames the sticks can be placed either diagonally or vertically, as shown in the illustration. The bees will soon fasten this at the sides and top and the sticks can then be removed and the frames will be in a first class condition. If there be not enough comb to fill all the frames, as many should be entirely filled as possible. Make it straight so that the frames can be put in without crowding the comb against other frames. Where there are any fragments of broken comb left it can be made into bees wax which is quite valuable. If there should not be enough comb in the old hive to fill all the frames of the new hive, foundation sheets, which are sheets of beeswax rolled thin and the impression of the base of the cells marked on it, should be put on the remaining empty frames. All foundation should be fastened in place with fine wire imbedded in it. In most cases where

this is not used the bees will not build the comb straight. This foundation is very important and should be used by all practical bee-keepers.

We have mentioned the possibility of losing bees at the swarming time. This can be entirely prevented by clipping the wings of the queen at any time after she commences to lay, and there will then be no need for the bee-keeper to chase swarms and climb trees to take them down. We have not had a swarm of bees in two years, by dividing the colonies. If the wings of the queen be cut she can not fly, and even if they start to swarm they will miss the queen and return to the hive. If the owner is near he can pick up the queen and put her near the hive entrance, or if the hive be close to the ground she will crawl back into it when she finds she is unable to fly away.

Races of Bees.—There are a great many different races of bees, with varying qualities or characteristics. While it is my firm opinion that the best bee for the American bee-keeper, according to our present knowledge, is the Italian, yet the Caucasian is so gentle as to have earned the title of the "stingless" bee. Students and visitors at the College have handled my bees on the frames without any smoke having been used in opening the hives or any other way, and without veils or gloves, as shown in the illustration. However, with proper handling, the Carniolians and the Italians can also be manipulated without smoke. The Cyprians are the crossest we have, but they are at the same time great workers. We believe that there is great promise in the improved honey bee which has the Caucasian race for the paternal ancestors and the Cyprian race for the maternal. This cross would give from the male the gentleness which is characteristic of the Caucasian race, and from the female the hustling ability to gather honey, which is a feature of the Cyprians.

Wintering Bees.—We do not think it necessary to have special caves or cellars for bees, although there is great loss in this State each year from the failure to winter properly. We have found that the first requirement for wintering is to have the hives well filled with honey. Each hive should have at least 30 pounds of sealed honey or be fed with sugar dissolved in water till they have that much. In warm weather this can be used at the rate of one part sugar and two parts water, but in cold weather they should be fed in equal parts. Each hive should have a queen and be without disease or moths. When the larvæ of the bee moth is found in the hives they should be well cleaned, and they will be in good condition again. Last year we packed out hives in large boxes with a thickness of four or five inches of hay or straw packing around them at all sides, including the bottom. Arrangements were made for the bees to pass out through a little box for the cleansing fly when desired. We lost but one colony, and that was due to changing them so late that they were unable to put in enough stores to feed them properly.

Bee-keeping for Women.—The success of bee-keeping by women has been proven by many ladies who have handled them with great success, showing they are qualified for this.

Honey producers will find that the pound sections, put on the market in the most attractive way possible, will give them good

profit. If he desire not to produce comb honey but to produce the liquid or extracted honey he will need an extractor. He can then uncap the honey cells in the frame, extract it, and place the comb back in the hives. By careful manipulation he will be able to produce nearly three times as much extracted honey as comb honey from the same bees, because he saves the time of the bees in making the comb and since 15 pounds of honey are required by the bees to make one pound of comb. This amounts to a great deal.

No person should think bee-keeping is all smooth sailing. There are a great many points to be obtained, practical and otherwise, and these are objections to many people. They are liable to diseases, such as Black Brood and Foul Brood which has been known to carry off entire apairies. They may die by being wet and chilled or starved during the winter and from other causes. It is indeed true that for many persons the knowledge of this subject is very limited. To have the best success, the bee-keeper should read and follow the suggestions given in some of our modern books on bee-keeping and subscribe for one or two of the seven up-to-date Journals published on this subject in America.

In conclusion, I wish to urge the importance of every person interested in joining the State Bee-Keepers' Association to aid in the advancement of this important but greatly neglected industry. We need legislation for the detection and suppression of contagious bee diseases and more instruction in this subject. "In union there is strength." When our State Association is strong enough or has enough members, it will procure for all bee-keepers the protection, legislation, aid and State publications that they need. For circulars concerning the Association, write to the Secretary, Mr. L. R. White, Office of the State Zoologist, Harrisburg, Pa., or to the speaker, upon whom rests the duties of the office of President.

On motion, duly seconded, the meeting adjourned until half-past eight o'clock to-morrow morning.

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Court House, Clearfield, Pa.,
Thursday, 8.30 A. M., May 31, 1906.

The DEPUTY SECRETARY: Gentlemen of the Normal Institute: We have now come to the last day of the meeting. Owing to a very pleasant change in the program yesterday, being Memorial Day, we were compelled to drop one session, and by the way, a very important session of this meeting. That session was important because it involved the entire management of township, county and State methods of the farmers institutes of Pennsylvania, hence we appreciate its importance.

There is involved in this the local management of the county chairmen. I have in mind quite a number of propositions which it is desirable to present to the county chairmen of the institutes of Pennsylvania, and by the very many requests coming to us asking that the session be not dispensed with, we have finally decided that at least the one-half of the forenoon shall be devoted to the interests of farmers' institutes.

Before entering upon the work of the session, I want to make a

statement or two. I am in receipt of a letter from Professor Wells W. Cooke, one of our excellent scientific institute instructors, of Washington, D. C., stating that he is prevented from attending this meeting on account of the severe and probably last sickness of Mrs. Cooke. In this sad hour we all join in heartfelt sympathy.

Also that Professor Surface, being President of the Bee-Keepers' Association, asked me to request all persons engaged in bee-keeping in Pennsylvania to send to him at Harrisburg, Pa., their post-office address, as he desires to correspond with them. Please bear that in mind all those who are engaged in bee-keeping.

I think there are no other announcements, except to say that those persons who were placed on the program for what will be the regular session this morning, all I believe have manuscripts, and if time will not permit them to be heard, they will be printed in our bulletin, giving the proceedings of this meeting, so that if you do not hear these papers to-day they will all come out in printed form in due time.

MR. HUTCHISON: Mr. Chairman, I move that the Deputy Secretary be requested to send a telegram of sympathy to Prof. Cooke in this sad hour.

The motion being duly seconded, it was unanimously agreed to.

Mr. A. P. Young, of Millville, Pa., in the Chair.

MR. YOUNG: We will now take up the order of the day. The first thing in order is the discussion which is to be opened by our worthy Secretary Martin.

The DEPUTY SECRETARY: Mr. Chairman and Ladies and Gentlemen: When we are at home and in our office sometimes we think of some very elaborate things which we desire to express and present to the Institute. There are two or three reasons why I shall not give a long talk as I had expected and intended to do; one is,that about ten days since I was taken with a very severe and heavy cold which simply prohibits me from using my voice beyond a certain stage, and you will understand that I must necessarily abbreviate. There are, however—and I want to say in the out-start to the County Chairmen of Institutes, that whatever of success and advancement in the great work devised for the instruction of the farmers of Pennsylvania, is largely due to your untiring and unselfish effort in the counties which you represent.

Now do not understand by this statement that you are all perfect men; do not understand that you might not have done some things which might have accomplished better results. Indeed, whenever the time comes that we have arrived at such a condition when nothing better can be done, our work will have been accomplished in Pennsylvania. But let me say quietly to you, that as long as man tills the soil on this great earth of ours, the time will never come when it will not be necessary for the farmer to procure and secure knowledge, practice and instruction, greater, broader and deeper than he has already attained. The reason for this is, that agriculture embraces and gathers within itself all other sciences; chemistry, botany and everything pertaining thereto, and those sciences are based upon great natural principles; principles that emanate from

their source in the great Divine mind, and can you not readily see that the mind that is finite will never be able to fathom the depths which we must search after in order to arrive at the best conclusions and the best practice upon the farms of Pennsylvania. This gives us some idea and enables us to some extent to appreciate the high and the vast work in which we are engaged, and in order to be more direct, I have thought and now fully believe, that in the history of farmers' institutes in Pennsylvania, that we ought to have more compact county and township farmers' organizations; that we ought to have in every county in Pennsylvania, a permanent organization of farmers known by some appropriate name, organized as a continuous body in order that we may carry on this work more efficiently in conjunction with the Department of Agriculture, and to uphold and sustain the hands of the county chairmen of institutes. With that object in view, we have prepared and arranged a constitution for county farmers' institute-societies providing for the organization of such a society in every county in the State. We have had this printed. We want the county chairmen of institutes and all others to get a copy, and if some one will please distribute those now among the audience, I shall be obliged.

The need of such an organization is imperative. To-day there is just one organization in Pennsylvania which gives you, as the chairmen of institutes, the right to ask a man to serve and aid in this work, the county society, and if he chooses to serve, we recognize him as county chairman of institutes.

Now there has grown up in Pennsylvania many organizations of farmers. We have farmers' clubs, farmers' alliances, farmers' unions, local granges, Pomona granges, those in all or nearly all of the counties of the State, and these various organizations are organized voluntarily and thus they help you along.

Now if you will examine this constitution you will see that it provides—that out of these organizations, they can elect a committee, they can elect a representative from all these organizations, and they will form the executive committee who will make arrangements to help along with the local work of these farmers' institutes.

What we want to do, in my judgment, is to so arrange matters that we will have in every county and township in Pennsylvania an organization of men devoted to this work. There is just a little more about that yet. It is my duty and it has been my work for several years to collect from the agricultural societies of Pennsylvania the statistics of their fairs, and exhibitions, the moneys expended, and I am in particularly close touch with them. I find that probably more than a half of these county fairs do not really represent a real agricultural fair or agricultural exhibit.

Now what do we want as farmers? In my judgment, to get an organization of bona fide farmers who have at heart this work. There is an Act of Assembly under which some of the county chairmen of institutes have been acting very wisely; even this county of Clearfield has availed itself of it; the county of Lackawanna, where Mr. Northup has had charge, has availed itself of these aids; so I say we want county farmers' organizations and agricultural societies that will raise funds to the amount of a hundred dol-

lars; they can draw from each county an equal amount of a hundred dollars to be used for agricultural education and development.

Thus when we form an organization of the character here intended and get your societies in the townships and counties thoroughly organized, you will have a demand for fifty or twenty-five days of instruction, as you choose to make it, and get a thousand or two thousand members. Then you will be able to raise that hundred dollars without an effort and draw the additional hundred dollars from the county and be equipped, not only for agricultural exhibits in these institutes and other places, but you will demonstrate that you are actually engaged in developing agriculture in your home counties.

A Member: Does not the law say that it must be a free contribution?

The DEPUTY SECRETARY: It is a free contribution; it is for the purpose of agriculture and no other.

Now that is not all that is in our mind about this matter. My friends, agricultural education, in order that it may be accomplished satisfactorily, is a great work, and to a great extent is twofold. The first is to have mentally conceived an idea, and the next part of that education is to carry it out with your hands in actual practice. We have come to a time in the history of farmers' institutes in Pennsylvania in which we not only give and must give the correct oral instruction in open farmers' institutes and we can never dispense with that—for as long as man lives and has a tongue and intellect, we must have oral instruction, but then, in order to couple together these two great principles, we must organize in these counties for actual practice, namely, schools of practice in our institutes running for a week or two weeks in the different counties of the state in which we will take up such subjects as dairying, and we want to enlist the young men as well as the old in the work, and have a two weeks' school at some of the dairy farms, and gather in a hundred young men and old men, and go through the actual practice, not only teaching by word, but by practice.

We are approaching that time, and when it comes, then we will have with it, out on these farms of Pennsylvania, men who, when they enter upon any special line of farm pursuits, will not only have the mental knowledge, but the practice to carry that on to success.

Now I have developed to you somewhat the degree of instruction both oral and practical that I think we should have in these farmers' institutes. I do not know how you feel about this, I think I know, but I may be mistaken, but I am certain that you are all interested in the work; I know that from the conversations and letters I have received. Take the suggestions home with you, and discuss them in your grangers' and farmers' unions and amongst your friends, and in counties where there is no organization, and start to work and form these organizations, and when the next Legislature meets, we will have the law so amended that it will amalgamate and bring together all the different organizations in one great combine for united effort in this work.

My friends, until that time comes, some improvements which we think should be acted upon by the County Chairmen, which are es-

sentially necessary under existing conditions, and I know you will not regard me as censorious when I say that there is not a county chairman of institutes to-day who has fulfilled his duty as he ought to, if he has not had prepared at least six weeks before an institute is to come off in his locality, a complete program for that meeting, and had it printed, and that program ought to be printed in numbers—large numbers, and distributed throughout the country as a means of giving information to the farmers of that county as to who of the State speakers will be present, the topics they will discuss, coupled with an invitation to be present.

I believe that in every county except two or three, this has been done. I know that one or two counties failed to print programs, and I call attention to that. We suggest that the program for each institute, say there are to be held eight institutes in a county, four two-day institutes, where the practice has been to have the program for one printed on a separate sheet of paper. The next one is printed on another sheet of paper and so on; the expense in that way is almost trebled. I advise the county chairmen of institutes to go to some printer in their county and have the programs for all the institutes of that county printed together on one sheet; go to that printer and find out what he will print a certain number, one thousand or two thousand for, and have them all printed on one sheet. That becomes an advertisement not only for one institute but for all the institutes in the county, and in that way you will get them all printed so as to cover all the institutes to be held in the county nearly as cheaply as you will the programs for one institute. I throw out that suggestion to you now. I think it would be good practice. I want to suggest further, make that a business proposition everytime. I do not mean by that that you should go to the printer and try to "jew" him down, not that, but make it strictly a business proposition.

Now my friends, I want to commend these county chairmen for a good many things, but time will not permit me to commend you for all the things I would like to mention.

There is one matter to which I wish to direct your attention. These speakers who come from a distance, you know they are engaged in a very arduous work. They are often obliged to travel by day and by night; they endure great exposure, and the time has passed, my friends, when the impression that once prevailed to some extent in Pennsylvania that these fellows were traveling around over the State having a good time at the State's expense, needs refutation. You know and I know that such is not the case, and no county chairman of institutes has discharged his duty to the fullest extent that has not arranged for a hotel or suitable stopping place for these lecturers and procured a separate room for every one of them. The State is willing to pay for that, such accommodations ought to be provided, and provision ought to be made not only for a separate room, but if the weather is cold and severe, that room should be heated and made comfortable for these lecturers. Why do I say all this? Simply because these men have to talk in rooms where the ventilation is frequently not good, and they have to talk there for an hour or two hours and they leave that room with their physical condition somewhat depressed, and a good deal heated, and then they go into a room in which no one has slept for probably

six months. Now just imagine the effect upon that man. We call your attention to these things. It don't make any difference whether he is at a farm house, a hotel or a boarding-house, he should be suitably taken care of, and the State is willing to pay for it, and we believe it pays you in any way you consider it, because we want to keep these lecturers in the very best physical condition, possible, to get the best work from them. I could name one of our lecturers, one of the finest on the force, who had to sleep one night in a room that was down below zero. I call your attention to this seriously and earnestly.

Now, my friends, if there are any questions which you want to ask in regard to other conditions about this institute work, we will gladly talk along that line, because you know, this meeting was set apart for the exchange of expressions and experiences and the object is to open up all these questions that arise in the course of our institute work, and the desire is to have a free interchange of experiences and expressions as to the best things to be devised for the management and the carrying on of this great work of farmers' institutes, and unless you have some questions to ask regarding this matter, I will take my seat and the meeting will be opened up for your free discussion.

I see my old friend Agee in the room, and before you get properly upon this work, I would like to hear from him.

MR. AGEE: Mr. Chairman, Ladies and Gentlemen of this Normal Institute: I want to thank you for the greeting given me, and I want to say that I look forward every year with pleasure to your spring meeting. I know you men, the most of you, personally, and I know your worth to the State, and I say this without any desire to pay you an empty compliment. You are the President, you are the Board of Trustees, you are the Faculty of the popular Farmers' College. That is true in every state. These institutes are the popular farmers' colleges in the land and the work you are doing is an educational work of the greatest value in the building up of a more intelligent and scientific agriculture. You give up your time to it, and as I meet you here each year and think that you have in Pennsylvania a great body of men who are willing to do all they can for agriculture, it is one of the pleasant sights and the meeting is one of the pleasant meetings that it is my privilege to attend. I look forward to these meetings on account of the profit I expect to get from them.

These Normal Institutes are of great benefit to the State, and an important part of the educational work of the State, and they furnish the means of making better lecturers, and that is the demand all over this country. We are now only at the beginning of a new educational scheme the institutes are developing along various lines in our various states. You Pennsylvanians are improving the institutes of your State and are working along good, practical lines. In another state you will find that the development is a little different, but you have a common purpose. The efficiency of your work depends upon you, and the Normal Institutes are designed to make better workers of us all.

Now yesterday, when I had the privilege of listening to a number of lecturers, that especially of Professor Massey, it seemed to me worth a great deal, that we could be brought together to study the

soil fertility problem; that is the one that interested me most, and it seems to me very desirable that we should try to get together on a certain line of teaching that we can carry to the farmers—that we should get a line that it would be safe for them to accept, that will mean soil improvement.

I won't take up your time; I have no special message for you just now. I came in here as an old worker among others merely to enjoy the privileges of the meeting. I think you are doing a great deal, yet I think sometimes you might do more; you might send a few of these men to the State Legislature for the good of that body and when they get there, we might be able to secure appropriations that are needed for the better development of agriculture. If you pick out some leading member and make him the Governor of your State as representative of the farmers' interests here, then it seems to me that you would have been doing your full duty for Pennsylvania.

Again I thank you for this kind greeting. It is one of the pleasures each year to me which I always look forward to, and I wish you continued success and hope that your efforts made in behalf of Pennsylvania agriculture may bear such fruit as to put it on the plane where we all wish to see it.

DEPUTY SECRETARY MARTIN: Now if there are any questions let them come in now.

MR. HUTCHISON: Will it not be better to call the list of counties?

The DEPUTY SECRETARY: The trouble with that is, it exhausts a great deal of time; whatever you have to say, say it.

MR. NORTHUP: Mr. Chairman, I would like to talk five minutes; I am just persuaded that this is one of the most important sessions that we shall have in our spring meeting and I feel that it will have a very important influence upon the work which we have to do. I have been a chairman in the conducting of farmers' institutes for ten years and I have had the hearty support of Brother Martin in all that I have undertaken to do or I could not have undertaken the work, and when he called up that subject this morning in reference to better institute work, I thought that is just what we had to consider and just what we have been endeavoring to accomplish.

Now in the first place, the county manager has got to be a grand good beggar, because my brother over here says that the money secured has got to be secured by voluntary contribution, and it is one of the hardest things in the world to touch a man's pocketbook, or anything there is concerning him that costs money and the fellow that stands up before an audience of people to get the money has got to be a grand good beggar. I think sometimes he ought to go into a Methodist meeting and hear the presiding elder beg, for some object for which he wants to raise money in the church as an object lesson, for he certainly wants to be a good beggar.

I remember an instance in which a young man was going to be ordained for the ministry, and they called together a large council of brethren and some old ministers and they were about to ordain the young man, and one of the old ministers stepped around to the

front and wanted to know of the audience how much they were going to give him as a salary, and they told him they were going to give that young man a salary of a hundred dollars a year, and the old minister stepped right up to the front and he said, "I would like to know if there is any brother here who has a long ladder," and one brother said, "I have got a pretty long ladder." "Well," the old minister said, "I want one long enough to reach from here clear up to the good place, so that the dear young fellow you are about to ordain, and whom you propose to give a salary of a hundred dollars a year, shall have the privilege of going up that ladder every Monday morning and coming down on a Saturday night so that he can preach to you, for he never can keep soul and body together in this world on a salary of a hundred dollars a year."

Now an institute manager has got to have this power to influence his people and to get this money, and if he is a grand good beggar he can just get this hundred dollars and he need not fail.

I said to our people in Lackawanna county, "I will assure you of a hundred dollars at the close of our institute, and then go down to the County Commissioners and we will have a hundred dollars more;" and some one said, "What are you going to do with this money?" I said, "I am going to hire the very best men as instructors that I can get in the State of Pennsylvania, I am going to get the very best men there are on the force to come and work in the farmers' institutes in this county, and I want to say to you that the time has come when not every fellow can stand up in a farmers' institute and instruct the people. You have got to have the very best men you can get hold of, and this $200 is little enough to enable you to succeed in your efforts and to bring in these men.

MR. BLYHOLDER: Mr. Chairman, I would like to say that for ten years we have never failed to get this hundred dollars and last year we got $101.25.

MR. NORTHUP: You can get it, and you can push an institute with enthusiasm. There is so much depends on the county chairman to make it a success, that he has got to be master of the situation. He has got to study his business, and if he gets it in his mind, lays out his plans, it won't do for him to just trust to his memory, but he has got to have a little memorandum right here in his pocket, on which he will have noted all the arrangements he has made, and then when he wants to know just what to do when he starts his meeting, he can refer to his little memorandum and see what comes next. He has simply got to glance at his memorandum there, and see what is on the program, and he can carry his institute right straight through. He has got his helpers right there, and every thing in order and the institute with such an arrangement as that will be a success all over Pennsylvania.

You take an institute manager like that, and you will find that the politicians all over his county will come up to him and want his support. They will say, you know more farmers in this county than any other man there is living there, and he will be sought for.

A Member: Mr. Chairman, I would like to ask the question whether when the County Commissioners pay $100 if an additional $100 can be secured for institute work?

The DEPUTY SECRETARY: No, it cannot.

MR. MILLER, Somerset County: Mr. Chairman, I have listened to the orders of our worthy institute manager that we should keep the lecturers in good condition as soon as we have them in our hands. It is an important matter. I know that in our county of Somerset we can't always do it. We had an institute in one part of the county, in a little town where we had a hotel which we expected to be warmed up and they promised to have it warmed up, but I am sorry to say it was cold weather and it had not been warmed up to any extent, such as we would have liked. They were not prepared to do it; they did not have the heating apparatus in, that they should have had although it was not as I say, much of a place, just a small place in the country where it was not up to date.

Now it is a hard task always for the county chairman to have everything just right. The appropriations given to him is not sufficient to carry on the work as he should. He does not get enough. Twelve dollars and a half a day will do for the day but to prepare for the institute and to do all this advertising which is proper and right, it is not enough money, and the appropriation ought to be larger. We spend a great many days that we have nothing for, not a penny, and the chairman gets discouraged when he has to spend so much time just for the benefit of the farmers in his county. The farmers don't appreciate it. They say, "That fellow is in it and he makes lots of money out of this business." You will hear that in every county. I thought myself when Senator Critchfield was chairman that he made something out of it.

The DEPUTY SECRETARY: You learned a lesson.

MR. MILLER: Yes, learned better. I don't complain about that; I am willing to spend weeks in winter when I haven't much to do in this work, but really I don't want that cast into my teeth that I am making money out of that. I don't like that.

A great deal depends upon the county chairman, and if he can get to help him men to stand by him and make out a program, his work will be much easier. We have different committees appointed to come and help us make this program, but they generally throw the burden on the chairman.

The DEPUTY SECRETARY: Don't you think that if you had an organization such as this constitution provides for, you could do better.

MR. MILLER: I believe that is a good thing. I believe there ought to be more agricultural organizations, so it would come home to every farmer in the county, as near to his home as possible, and have these local institutes and county institutes all through the winter and get the people aroused all over the county and have fifty institutes instead of two or three or four or six—have fifty different places if possible to hold these institutes, and I shall do my best to establish this organization in Somerset county.

MR. HEGE, Franklin County: Mr. Chairman, we have a county organization in our county, and some eight or ten years ago we did have some trouble at first to get the people together. For fifty

cents they can be a member of our organization, but since that time during our farmers institute sessions, we have somebody that goes around in the audience quietly and explains to them, whilst it has been explained before by one of the lecturers, but explains to the people the importance of being a member of the association. Now then, last year we drew $90 from the county.

My short term as a member of the Board expired a year ago last winter. I believe Mr. Martin was present the night I was elected. I stated there at that time the fact of my being a member for the fourth time in the Board. I was elected whilst I had to go to the telegraph office—I was elected the fourth time. Now I stated that I would prefer not to serve; the reason is not because the work is unpleasant to me, but because I have every year to spend some of my own money in addition to the amount of the appropriation in order to make my institutes a success. I won't have a failure if it can be avoided so I went down in my own pocket. The committee—our executive committee agreed to make good all the expenses I had there over and above the appropriation from the State. They agreed that they would make that up, which they did. Take for instance, one of my institutes last year, where I arranged with the committee on program; I allowed the committee to spend what is appropriated, twelve dollars and a half, and when I came to settle with them, they had spent eighteen dollars there at Fayetteville, and they asked me to pay the bill. There was $45 coming to me from the State, and I had the programs to pay for, my own car fare and hotel bills to pay, and sometimes friends came from a distance and I took them with me to the hotel and paid for their dinner, so you see where I was, with that $45 where they had spent $18 as I stated. You may want to know how they could spend $18. Well, they were determined to make a success of it and had to spend it. The only trouble with us is, not because we don't have enough people, but the trouble is how to provide room for them, so we get the best and largest church in the town.

There was a musician in the college, it was his home college when he was a boy, one of the best musicians we had in the county, so they got that man to come out and they paid him $10. It looked like an extravagant sum, but I didn't regret it, for in that church we lifted up everybody that was there, and so in that way it is a great benefit to have an organization and these members of the organizations will help you to make your institute a success.

Now there is one question that I would like to ask my friend Martin: You recommend to us to have our programs all printed at one printing office, and the same program for all the institutes. Now I do not see how it is possible to do that. At Fayetteville we have several gentlemen who are leaders, who head the program of that institute, then we have a Music Committee; now then it would not be suitable to use that program we have for Fayetteville in other places.

The DEPUTY SECRETARY: Just let me make an explanation. My recommendation was not that you should have the same program for each meeting, but that you should have your program, for example, your Fayetteville or your Marion or your Chambersburg meeting separately—have a separate program for each meeting, but have these separate programs all printed on one sheet or folder,

or pamphlet, in order that when you come to hold your institute you will have all these programs for these different places on the one pamphlet or sheet so that all the people who attend the institute will see that you are to hold an institute at such a date at the other places in your county where you intend to hold them, whether it be at Marion or Chambersburg or elsewhere in your county, and in that way those who attend each meeting will see what is to be done in your other meetings and it will be an advertisement and they will then know what is going on all over the county. Do you see the point?

MR. HEGE: Yes, I see the point. One of the chairmen told me once that we could save money by having our programs printed all by one printer. Now I am a subscriber to all our county papers and two or three years ago they took a program for the institutes all to one office; they got the four programs all printed for $10.00, whereas they often charged me from $4.50 to $5.00 for a single program. When we came to get our institute advertising in the papers usually they put in a local for us naming the dates when our institutes were to be held, etc., and the lecturers expected and so on. Now there are four printing offices there and they complained and said to somebody that we gave all the printing to one office and they never put a single local notice in the papers that did not get any of the printing, about the institutes. Now that is one reason why we get them separate if it does cost a little more.

DR. CONARD: Mr. Chairman, the amount of money not being sufficient struck me rather forcibly. I thought our brother from Somerset seemed to think he was a little short of funds to carry on the institute work. I think that the plan our good friend Martin has outlined is an excellent one, and I think it will very materially reduce the expenses.

MR. MILLER: I would say that we always do that.

DR. CONARD: And I believe also that twelve dollars and a half a day is plenty. I do not think we need any more than that amount to carry on the institute work. If it cannot be carried on for that amount, I think there are plenty of local contributions which will be made to meet the deficiency.

In our own county of Chester I have had institutes held, the very best institutes we have had, for much less than twelve dollars and a half a day and I have had some that cost a little more than twelve dollars and a half a day. Right there seems a condition, and I would like to call Mr. Martin's attention to it as well as the rest of those present. We have one organization in our county who own their hall; they are a good live organization and they have an institute every year. They own the hall and they expect their $25 every year if they hold a two-day institute. They say they are entitled to it by the bulletin; that it is so stated in the bulletin that they are entitled to it.

While they do not say it in these words, they give us to understand that it is none of our business whether they pay $5 or $20 for the rent of the hall; they furnish the hall and they want the $25. They hold the institute, they make the program and furnish the

program and the advertising and it is always a success. Now I think that a good little bit of that money goes into the treasury of that organization and is not spent for that particular institute. They boasted that they had paid a good dividend on the money invested in the hall and I know that we helped them to pay it.

I would like to have some instruction that would make it so that I could say to them that they can have just so much rent for that hall, and that the institute can be held for less than twelve dollars and a half a day, which I believe it can, that I would be instructed so that I could use the remainder of that $25 at such other point as would be best in the county. We usually hold another independent institute in our county. Sometimes I have a little money left and when I do I am glad to do it.

I think if I had such instructions as that, I could have more, and have enough probably to hold one or two, or two or three more days of institutes for the same money.

MR. BLYHOLDER: I would like to ask whether you have been giving them that $25.

DR. CONARD: I have; I did it, but I did it under protest.

The DEPUTY SECRETARY: You have asked a question Brother Conard as to your duty under the Act of Assembly; that Act provides that the expenses per day shall be twelve dollars and a half providing the actual expenses amount to that much. The Act does not say that there is absolutely twelve dollars and a half set apart for local expenses, but it does say that providing the actual expenses amount to twelve dollars and a half a day, that is the limit. We recommend to the chairmen under this Act to keep the fund within their own control. I would suggest that you make arrangements with the local people there for the use of that hall for so much and pay that and no more; so much expense for the hall, so much for their advertising and local expenses, and so on and so on. You are then acting in conformity with the law governing you in that case. I know that you may delegate your power to these people in a legal way, you may throw this fund into their hands if you so choose, but you are the arbitrator, you are the one who under the Act of Assembly the Department must look to for the careful distribution and expenditure of this fund.

DR. CONARD: That is all right, but their bill comes like this; they say so much for advertising. Now they are not always in harmony with us; they do not always adopt our advertising, but they usually get some more bills struck to suit themselves. They make the advertising bill of pretty good size, so that really when it comes to the settlement, it takes all the rest to pay them for the hall, for they are a little like the traveling man with the suit of clothes. Maybe you don't see it in his monthly expense account but it is in there all the same; so they get it in. I think it would be better if we were instructed as Mr. Martin says in the Bulletin. I have no doubt that we are so instructed now, but if there was another clause added in the Bulletin that we should be rendered bills for every item of expense incurred at each and every institute, and that we are held accountable to the State for those bills, I think it would be better.

The DEPUTY SECRETARY: That is exactly what you are.

MR. BLYHOLDER: I am rather surprised at the remarks of the gentleman. I have always felt that I was responsible, and required to render a bill for every cent of expenses and I am surprised that any gentleman could draw that amount without rendering bills. I have felt this way also; in one locality in the county which I represent and have represented for a number of years, they have been accustomed to hold institutes irrespective of any consultation with me. They said, we are going to hold these institutes. I said, all right, you can hold them but you will get nothing from the State appropriation. The result was that they kept them up for two or three years and then when they went to arrange for the next institute or before they arranged for it they sent a delegate to the meeting and they begged that we would go in partnership with them, and we did, but we had control, and we retained control of the institute fund right along.

My method of holding an institute is to meet with the committee wherever I intend holding an institute, and I assist them in preparing the program. When the time of holding the institute comes, I meet my speakers and stay with them until they leave the county, and I pay all the bills for hall rents and whatever our necessary expenses are, and then I will render that account to the State, and in a number of years experience I have never drawn the amount of twelve dollars and a half per day because I believed it was not just, because I had not expended it. I think that is correct. Am I not correct, Brother Martin?

The DEPUTY SECRETARY: That is correct.

MR. BLYHOLDER: I want to say that I am glad our worthy secretary has presented a schedule, or a plan or a draft of an organization, such as he presented to us this morning. I have felt for some time that it was necessary for us to do something of that kind, and in the last two months I have been in correspondence with the various townships and the people in my county. This has always been a lame point in my county to get a representative for the June institutes. I am sure that I am very glad that this suggestion has been presented; if that is not just exactly what is wanted, I know that the Secretary will agree with us if we change it to meet the various wants of the different localities.

The DEPUTY SECRETARY: Certainly, this is simply a draft or a general outline, subject to such modification as may be required.

MR. BLYHOLDER: I think that the conditions are such that something of this kind is necessary, and I hope that we may have these organizations in every county, so that they may bring their influence to bear on legislation by means of which we shall be able to secure more satisfactory results than in the past.

I think that we ought to go further, and in a measure substitute these organizations which we propose organizing for the many so-called agricultural societies that are at present organized in our county, that perhaps have not an agriculturist holding in the whole association. Now it seems to me that we ought to substitute these

proposed societies for those which are now drawing this hundred dollars from the county. We know of a number of instances where they are doing that, and it seems to me that we can't organize too quickly. We ought to have that other hundred dollars that the good brother says he begs still. We need it.

The institute work is an educational work, and referring again to what was said by the Secretary, I like his suggestion in the way of programs also. The good brothers adjoining me in Westmoreland county—we tried an experiment something along that line, but his suggestion goes further, and more, his experience also goes further than that of the good brother, and I think it a good idea to follow out in the printing of the programs. I think that the programs should be printed with the subjects upon each program together with the names of the speakers, the dates, etc., of every institute in the county. We have tried that and it was a success, although I feel that we can improve that by putting on to that program the subjects that the local speakers are to discuss and preparing a local program for every meeting. The plan that we followed last year was, I think, a success, and I believe a little in advance of what we had before, because we took just the subjects that were suited to the audience that was present. You know in some places where institutes are held, the audience may perhaps be an audience interested in dairying, while in another place their interest is in some subject entirely different. That afforded the opportunity of taking from the program the subjects suited for the persons present, and we tried to do that, and I think it worked admirably.

Now another matter, I endeavored to arrange when they were together in the June meeting—I said to them, "Do you want an institute?" And if they said yes, I inquired, "What are you going to do for that institute? Are you going to furnish the hall or are you not?" If possible we required them to furnish the hall free, though I have had to pay for it on various occasions, and even sometimes been obliged to put my hand in my pocket too. It don't go very good when we have to expend our time and then in addition pay out money of our own for expenses. It seems to me that by forming these organizations and going to work together we can carry on our institutes very successfully, and more than that, can combine with them more educational work that is so absolutely necessary for the farmer to-day, and in the way of music I would say that in some places we must have music, must have a band and some places pay for it, as the good brother has suggested. I have come down to this. I say to them if you want to furnish us with entertainment, very well and good, we will thank you very much if you do, but if you can't do it without having us pay a large amount for it, we must omit it. You know farmers are often good musicians and in many places we have just as satisfactory music as though a band was employed.

MR. BEARDSLEE: Mr. Chairman, I have been to the institute round-ups a good many times and I do not know as I have ever occupied the floor before. In five minutes I will say all I wish to say. When I was twenty-two years of age I was put in charge of a school-house over a large district, and after I had engaged to work through the winter at my first school, the district was divided, and I was put in over the advanced scholars. I worked along

until the county superintendent came in, and at that time I had forty-four scholars ranging from sixteen to twenty years of age, and they all had been well instructed; their school laws are better than ours. The superintendent was a highly educated man; he asked no questions but made his observations and stayed a couple of hours and went out and told the supervisors in that district that the school was the best school in that county outside of the village of Owego.

Now that is just the case with the institute workers and the farmers of Pennsylvania.

I wish to divert your attention from the State Board subject. I wish to call your attention to the question of having men go out as instructors in whom the people have confidence to believe they can instruct them. In my judgment that is important, if we are to obtain the results desired.

Now, gentlemen, the attainment of success in the institute work is not a question of the dollars and cents paid for a hall, or for a band of music, but it is a question of the quality of your teachers, and a question of the impressions which they leave and of the importance of their instruction.

I drew the line eight years ago—I have been in this work for some fifteen years, and I drew the line—I would not go into a cold room under any circumstances. I have lain within three feet of a hot fire in a bar-room to avoid a cold room, for as I said, I will not go into a cold room, and I can stand thirty degrees below zero because I dress accordingly, but when ten o'clock at night comes, and the speakers have passed through their meetings of the day in a strong effort to leave an impression that is of value to the farmers, and then when they go to their stopping-place to remain over night, you can judge about the condition they are in. Give us a warm room, a warm hand and a warm heart and we will do our best in whatever work we have to do.

We have got to inform ourselves during the season, and be prepared for it. You are all wide-awake and the men who come to you as instructors must be wide-awake.

Now, gentlemen, from the incipiency of this enterprise there has been great progress made. I can recall when I have been driven away from a church door in places where institutes were appointed to be held just because of the prejudice of the people in that locality; they thought we were a humbug. Those prejudices have been dissipated by the force of the arguments presented, and the importance of the facts brought home to the farmers, showing the conditions which must be met. They have been impressed by the truth as it has been presented, so that now they value very highly the work that is being done for them along this line, so that now where appointments are made all over the State, they are anxious to receive us. I think my five minutes are up.

MR. RODGERS: Mr. Chairman, I move that the order of the day be taken up at 10.30.

The motion having been duly seconded and the question put, it was agreed to.

MR. McHENRY: Mr. Chairman, I have listened to these remarks here and I was very much pleased with some of them, and I want to give just a few words of my experience. I have found when I

had committees assisting me to make programs and to run the institutes, that I have always had to go down in my pocket after the expense account was rendered, when I had finished up. For three years I have had nobody to help and have attended to the business myself and I have never spent quite all the money allowable but I have had the luck to get churches, paying the janitor for cleaning up in many instances.

Now I believe this, that we want more brains put into the arranging and the running of our institutes, rather than more money. It is brains we want; I do not mean that I have those brains at all, but the idea I wish to convey is, that it takes a deal of arrangement and management, and that arrangement you must commence when your June meeting comes, and follow up to the very nights of the institutes, not a let up, if you want a success. I do not say that I have had a success in my county; that I will leave to the lecturers who have been there. I do say this, I have had no trouble in getting up my programs, and my papers have always done this. I would manage some way or another to get them to publish my program, which usually costs me from seven to ten dollars. Every paper in the county would publish that program in detail, put it from column to column; that was my advertising; besides that, drawing the attention of the people to it every few weeks beforehand, sometimes six weeks or two months before, keeping the fact of the institutes before the people, and advising them of what was going on, keeping it to the front, and with the posters which were put up all over the county, my advertising has been effective; I have had no trouble in that way. My great trouble has always been to get a place for those speakers, so that they would not be obliged to go into a cold room after talking for an hour or two or for the whole evening, and then go into a cold room, as cold almost as ice, and there is the trouble. Take my own county and I venture to say this, that it is the same with many others, and we haven't got a good hotel outside of the county seat, and I guess, include the county seat and not be far wrong. Now what are you going to do? They have no warm rooms, no rooms heated at all. Many times we have got to go to the farmers' houses.

The DEPUTY SECRETARY: Haven't you got a lot of coal out there?

MR. McHENRY: Yes, any amount of it, and they will let you dig it yourself if you want to, but the question is, how are you going to heat up a room? No fireplace, no stove in it. I have had them heat irons and bricks and all those things yet it does not accomplish the heating of that room, and this is a matter which has given me a great deal of trouble.

I like one idea that has been brought forward, and that idea is one of the questions before us here, presented by Brother Martin. I think that we want our counties organized in these societies, not so much for the money that it may bring, as because it will arouse our people and bring them together and when they get their heads together we will get better work done, and more concentrated work and more united work, and we want to get our whole people interested in these institutes.

MR. HOOVER: Mr. Chairman. I have been listening to this discussion with a great deal of interest. I belong to that class of workers called Farmers' Institute Managers and also take a part in trying to instruct farmers as to a better and higher mode of farming.

While I agree with all that you have said, there are still a few things that I think are worthy of our consideration, and one is that I think our institute managers should be men who are successful in their vocation themselves. If you want those to whom you preach your doctrine to have faith in what you say and what you preach, you ought to be able to show it in your own work. A man who cannot point back to his farm with some pride, or at least with some idea that he has set his standard high, or anyway a little above the ordinary, is hardly the man to be an institute manager, because it is a rule that the doing of a thing always has more force in it than the mere preaching of it. You must show what you can do. You must not only preach, but you must practice. If a man's work does not bear him out, he is a poor leader. That is one of the important features, as I think, to be considered by institute managers and workers. He must teach not only in the lecture field, but on the very farms as well, in order that persons who are prejudiced, who are indifferent, will see a forcible presentation of the argument made, much more so than he can bring before them in words, for if they see it exemplified right on his farm, it will be an object lesson far beyond any mere words.

I have known a number of cases of men who were leading men who stood by me in my work in my own particular county, where there is still a good deal of prejudice and indifference, they have stood by me showing results on their farms and in that way they drew in some of those indifferent persons who had failed to attend their institutes and who had looked upon our work as a species of humbug. By these practical means, those prejudices have been removed, and progress has been made, and more successful methods of farming have been taught, and you know we want to have better farming and higher farming; that is the main purpose of our organization. These are the things that occurred to me as things that are well for us all to take home and consider.

MR. SEEDS: Mr. Chairman, one of the gentlemen who has addressed you, has spoken about the great trouble the county chairman has to get a suitable room and accommodations for the speakers. I will acknowledge that it is all right during the day when his institutes are going all right, and he has got a good crowd that stands by him and he feels good until he goes to the quarters for the night and gets into that cold, dismal bar-room, perhaps heated with an oil stove that warns us of future punishment. That is what breaks an institute worker's heart and makes him homesick and he wishes he was home.

I have not got much complaint to make as I have nearly always got the best in the land and in the community, yet if you have got a cold room, I would say this, at least get the people to air it. The coldest room in the world is a room that has been closed up. Let the air in and go in about three hours before bedtime, and try to heat that room up. I have got into bed clothes that were fairly

damp because the room probably hadn't been aired for six months. Now an oil stove is the meanest thing to heat a room with that can be found. I would sooner have a lamp, one of those sixty-horse power lamps.

Now that is the only complaint I have to make. I generally get the best of treatment as I go from one place to the other, and the county chairmen are doing better and better every year. Six years ago I used to go up to the hotel or store in a town, and they said to me, "Why do you leave the institute?" Well, the reason was that I sat there and listened to some man's speech until I couldn't stand it any longer. Now you know they used to call me a big liar, but to tell the truth, I haven't had a man call me a liar for years, which shows the progress that is being made in agriculture in Pennsylvania. I went right down here in northwestern Pennsylvania and covered the ground that I covered six years ago, and I know that the institutes are getting better, and we are moving along and improving in our work every year.

I want to say to the man on the platform who is using his voice, use water externally, internally and forever.

MR. RODGERS: I just want to say that this institute work depends largely on the institute manager of the county just as much as plowing depends on the man handling the plow. If the institute manager is well fitted for his place and has the confidence of the people, he can control the institute work in his county and make it a success. I have had the honor of being institute manager of our county for twelve years, and I refer you to Deputy Secretary Martin or to the figures of the Department of Agriculture of the Commonwealth, and I have never yet spent the money allowed me for the institute work in our county. We have had good institutes and good lecturers and they have been well cared for. I have control of the whole management with the assistance of men that I know in the different parts of the county. I draw them to me; I consult with them. I begin with the June meeting and I do not quit until the last meeting has closed of our institute work. I get quite a good many of our local men to take part in the work. Our program is loaded with local men. We want to get out the young men and the ladies. We want to get out everybody that we can get to help, and to get them to feel that they are doing the work. I don't make a speech; I don't talk as much in my institute as I have said to you since I have got on this floor.

In regard to printing, I get it all done at once place and I get it done cheap, and have saved money every year since I have been at it.

I was the first chairman of the first institute ever held in our county, and the last one, too; it depends on the men who manage the institutes just as much as it depends on the men who hold the plow.

MR. BOND: Mr. Chairman, I want to say a few words on the question of accommodations for lecturers, and the criticisms which have been made as to cold rooms, etc. I would like to know if we are a lot of hothouse plants that have got to be nursed like a tender plant or an invalid infant. If we are, let us stay at home and not go

out. I am tired of hearing this line of talk, and I say let us stop these criticisms.

MR. HERR: About three weeks ago the chairman here asked me to prepare a paper, which I did, on the requirements of the institute worker. Now I want to say a little bit about an institute manager. My friend Rodgers touched the subject very nicely. He has been an institute manager for many years and is one of experience. I will also add that I have conducted all the institutes held in our county and they were among the first held in the State.

The institute manager is as important as the speakers are in the success of that institute. He ought to be a man of attainments and he ought to know something about human nature. He ought to be a leader among the people, whom the people look to with respect, a man of standing, a man of character, and a man of influence. He ought to be a speaker of sufficient force and distinctness to be heard all over the room. The institute manager that gets up and makes announcements that cannot be heard all over the room is a misfit as an institute manager. I remember being introduced on one occasion something like this: "Now, Mr. Herr will make his speech from Clinton County." You want a man who can foresee any local difficulty that is likely to come up. He must be a self-possessed man and not get mixed up. He must be a parliamentarian, and one who don't get rattled and mixed up because there is nothing like the fun for an audience if the presiding officer gets mixed up and don't know where he is.

There are occasions when some man is going to bore you perhaps with a long speech or something that is not of interest to the audience. Now there is a very mild and nice way of dealing with such men, and there is also a way of insulting them, and such a situation requires tact and careful handling, and if you have it you can prevent a whole lot of trouble in that line. The chairman should be a man who is firm and courteous to everybody in the audience. He must not be like that man whom my friend Agee once told us about who, when a speaker was occupying too much time and boring the audience, said to him, "Dave, Dave, my God, sit down, sit down, shut her off!"

Another important qualification of an institute manager is to be able to comprehend what is going on and to know whether it is practical in the community in which he lives, and when misstatements are made—many a time false instruction goes out that is not applicable at all to the place, and if a speaker gives such instruction, it ought to be promptly corrected. It ought to be corrected before people are led in the wrong direction, but the one great qualification, I might say the first and foremost, is that a man must have his heart in his work.

MR. NELSON: Mr. Chairman, one of the most important things we have on hand here to-day is to find out how we can get more institutes. Our county has been successful in increasing the number of institutes. I will introduce here a new member of the State Board of Agriculture, who was present at the society meeting last year, who will tell you how we raised the money for those extra institutes, that is Brother E. M. Davis, of Grampian.

MR. DAVIS: Mr. Chairman, I am not a public speaker but I am an awful worker. We have in this county an agricultural society which I was president of, and we held twenty-four days of institutes in this county, and I believe they were all a success. We have in our constitution of our county organization or agricultural society a clause that 25 cents makes a member for one year. We districted our county into twelve districts with the idea of holding twelve institutes of two days each but we held only ten. I said to them that if you will raise a minimum of seven dollars and a half by 25 cent membership fees, we will take that $100 to the Commissioners and have it duplicated, and it gave us $200 to run the twelve institutes which we accomplished last year very successfully. Brother Martin was with us for two or three days, and Brother Northup for two weeks; outside of that we did the whole work with our local help; the State did not supply us with one speaker; we can do excellent work among the farmers with our local help. I always feel that the local help should be encouraged, because it is cheaper than to get this foreign help. That is about all I have to say.

Time being limited, several members of the Institute had no opportunity of expressing their opinions in the general conference. Two members, however, have submitted their ideas in the two following papers:

## ADDRESS.

By W. H. STOUT. *Pinegrove, Pa.*

Not long since a delegation of farmers from my neighborhood went on an errand of investigation to see the home practice of a number of the State speakers who made rather extravagant statements at institutes of their practices and successes, and if I might repeat what was reported in detail, it would not make a very creditable showing. The conclusion arrived at was that they would not go any distance to learn from them, having more practical and better work near them in various lines of farming.

Pennsylvania farmers have the reputation of being leaders in their pursuit, and anticipating Horace Greeley, numbers went West early, in Conestoga wagons, across to Ohio, where they introduced their thrifty and industrious habits, so that our border state has some very good farmers, taught by farmers from the "Keystone" State of agriculture, and it is not the one state only, but many others all the way to the Pacific Ocean, and the Southern states as well, received lessons and inspiration from the sons and daughters from the farms of this State.

As westward the empire made its way, the East was neglected so we hear and read of abandoned farms, and neglected agriculture in some of the Eastern states.

As educators too, we lead, as evidenced by the fact that our institute speakers are in demand in New Jersey, New York, Maryland, Virginia and Ohio, showing conclusively that we are entitled to the credit, justly merited, of being at the head of the procession.

Possibly rate regulation has an influence in getting up railroad

outfits. Perhaps patriotism or policy may induce officials to generosity, and while it may, for certain sections, be appropriate, we at home need to look after the rural districts, the backwoods and isolated sections where trolleys carry no freight, and limited trains no intelligence.

The average farmer who belongs to that great primary class in less favored localities, on poor soil, and the tenant farmers, so numerous in the most fertile valleys, need instruction, example and inspiration more than those near the centers of industry and main lines of travel, where improvement, progress and intelligence are in the air.

Possibly my scheme to make the work more effective and bring it home to the indifferent farmers, may meet approbation, so I will outline a plan entertained in anticipation of receiving the appointment of Director of Institutes.

The schoolhouses throughout rural communities are standing vacant during the summer months, and to engage lecturers to go from one to another every evening during the week, and program the itinerancy in advance, sending three into each district to succeed each other alternate evenings and make their way from place to place on foot, in the meantime studying the topography, geology, crops suited to various localities, gather specimens of insects both beneficial and injurious, the characteristics of the people, explain to them on the fields the best methods of cultivation, applying fertilizers, how to use manure, show them how to milk cows, use the separator, make high-class butter, determine a balanced ration from the material at hand without having reference to purchased stuff, like dried brewers' grain, cotton-seed meal and hulls, and in a general way suggest methods of improvement, are a few of the duties devolving on the coming institute worker. It can be accomplished economically by traveling, as the San José Scale is said to do, and by boarding around like the earlier teachers used to do, it will be both practical and economical.

In order to give more publicity and dignity to the undertaking, a body now in the employ of the State, who do not know what to do with themselves, and the authorities as little, can be engaged to maintain order and ride around distributing programs, extending special invitations to whoever they meet. This has reference to the body known as the State Police or constables. This is only a rough sketch of the scheme, as the time alloted is too short to go into detail, which can be worked out later on.

Trimming trees, general orcharding, building economical and sanitary barns, refrigerators, stock breeding, marketing, general sanitation, hygiene, good house-keeping, bee-keeping, and explaining economical matters, are some of the other features that might well be included in the curriculum as occasion demands.

Subjects must be condensed so that each speaker is limited to three hours and is not permitted to taffy the county chairman or the women, and telling stories, unless they are true stories, will not be permitted.

## ADDRESS.

By MR. HORACE SEAMANS, *Factoryville, Pa.*

### "The Local Organization of Institutes."

We are told by one of the greatest lexicographers of this or any other land, that organization is the act of forming or arranging parts of a compound or complex body in a suitable manner for use or service, and certainly the organization of a local institute is sometimes very complex as far as my limited knowledge extends.

At the city of Scranton, in our county, is a Home for the Friendless. A childless couple went to this Home recently and adopted a five or six months' old baby and started for their home with it. They had not gone far when the wife says to her husband, "Here, John, you take the baby; I must go back and ask a question." When she had found the matron she asked, "Was the baby's parents Dutch, for if they are and the baby talks Dutch, what a dreadful fix we will be in, for neither John nor I know a word of Dutch?"

Even so with the organization of our local institutes. We must talk of what we know and know what we talk about, or we will be in a dreadful fix, and our speakers must talk on subjects that are of local interest, and it is essential to our progress that we interest the young farmer and induce him and his wife to attend the institutes.

There are sometimes unusual occurrences. I have in mind an institute held in our county in December, 1904. Our local society had appropriated a sum of money for music, and our institute manager (H. W. Northup) had engaged the services of a noted singer and his niece, but for some reason the singers did not arrive at the proper time.

In opening that evening's session, our manager stated with pain perceptible in his face, that we would all be disappointed, as the musicians had not arrived. At this moment he was called to the door and soon returned with a smile on his face, such as only Henry W. Northup can wear, and announced in a good voice, that we would have music, as Mrs. Krebs and her relatives had kindly come to assist. This music was excellent with frequent encores. One piece was a medley with just a touch of Yankee Doodle in it. The pastor of this church was absent that night, but he heard of Yankee Doodle early the next morning and finding Mr. Northup and my self, he told us very plainly that his church was not for Yankee Doodle, and that we could not have it again if such music was to be heard there. Of course we both apologized, but said we saw no harm in the music; if any one was to blame it was our local member who had invited Mrs. Krebs and her friends to come, who was also a member of that church.

Next night I was chairman. Mrs. Krebs came again but was met at the door and told that her music would not be allowed. She came to me and stating her case, asked to be allowed to make a few remarks during the evening. I consented, and later called upon her. She gave a short history of Yankee Doodle and said she had played that medley in the churches of the larger cities of the United

States and there had never been any criticism of it before, and finally said that the good people of that village would never be troubled with her music again. She was cheered all over the house. The pastor came to me at once, and asked why I allowed that woman to talk. I answered that I supposed that she had on oration; at least she did very well. Some one made a mistake, or was opposed to the organization.

The same year we had Brother M. S. Bond with us. You all know he is a potato talker and a potato grower. In one part of our county the principal crop is potatoes. We opened our institute there the second day at ten o'clock and Brother Bond was the first speaker. When his time was up, questions were being fired at him from all over the church, and he kept going till time to adjourn for dinner. He didn't stop there; the audience would not let him. The dining-room was in the church and questions were fired at him all through the dinner hour, and then there were those that wanted to hear him some more.

This might be called a successful organization of a local institute.

The CHAIRMAN: The hour has arrived for the order of the day, and the Committee on Resolutions, as I understand, are now ready to present their report.

MR. McCREARY: Mr. Chairman, as Chairman of the Committee on Resolutions, I will call on Professor Menges to read the resolutions.

REPORT OF COMMITTEE ON RESOLUTIONS.

1. Resolved, That we, the Farmers' Normal Institute in session, May 29th to 31st, 1906, in Clearfield, Pa., desire to express our hearty appreciation of the courtesies extended to us, first, by the county chairman of Clearfield county, Hon. J. W. Nelson, in inviting us to meet here, and in making good his promises for our comfort and pleasure. Second, to the County Commissioners of Clearfield county in granting the use of this court room. Third, to Hon. A. O. Smith, judge of the Common Pleas Court, for adjourning his Court in order that we might have the use of this room for holding our sessions here. Fourth, to the newspapers of Clearfield for advertising and reporting our meetings. Fifth, to Hon. N. B. Critchfield, Secretary of Agriculture, and the Hon. A. L. Martin, Deputy Secretary of Agriculture, for their thorough and complete arrangements for bringing us together with the State Board of Agriculture, and for the pleasure of hearing the distinguished specialists they have brought here from a distance to instruct and entertain us.

2. Resolved, That we cordially welcome the announcement of the plans for a Farmers' week at the Pennsylvania State College during the coming Christmas vacation for the purpose of discussing the modern method of seed selection, stock judging, butter scoring and other important matters of farm practice. That, in view of the high practical value which such work has shown in other states, we bring the plan for a Farmers' week to the attention of the farmers of our neighborhood, and urge them to avail themselves of the advantages it offers.

3. Resolved, That we appreciate and deplore the difficulties that lack of funds brings to the Board of Trustees of our State College, and we pledge ourselves, and earnestly urge all agricultural organizations and all individuals who are interested in agriculture in our State, to use all honorable means to secure adequate appropriations to enable the Board of Trustees to bring the agricultural branch of our college up to as high a state of efficiency as is now enjoyed by the Mechanic Arts branch.

4. Resolved, That it is the desire of the members of the State Board of Agriculture and the institute lecturers of the State of Pennsylvania, and that we recommend that the Legislative Committee ask for an appropriation to be used by the Department of Agriculture to pay the services and expenses of competent persons to instruct the shoeing smiths of this Commonwealth in their vocation thereby preventing the many serious diseases commonly brought about by the lack of knowledge on the part of the shoeing smith, which would be a great benefit not only to the shoeing smith, but to the horse owners and the farmers throughout this State.

5. Resolved, That we suggest that the State Breeders' Association and the State Dairy Union hold their meeting at Harrisburg during the same week that the State Board of Agriculture meets in order to save time and expenses of those who wish to attend any or all of the meetings.

6. Resolved, That the township laws relating to roads, etc., should be codified and published in such form as the school laws now are.

7. Resolved, That we demand such legislation as will make electric railroads common carriers, and that they be given the right of eminent domain the same as the steam railroads.

8. Resolved, That we insist on liberal legislation and appropriation looking to the completing of a system of macadamized highways in this State.

9. Resolved, That we heartily endorse the great public movements now in operation in the exposure of graft, in all its devious forms, and that we pledge ourselves to sustain this effort until graft shall be banished from government, corporate and public institutions.

10. Resolved, That we favor the passage of an Act providing for voting upon questions of public policy for an expression of opinion, if ten per cent. of the voters for Governor at the last previous election shall so petition.

11. Whereas, In view of the fact that from numerous sources all over the State have come demands that the agricultural interests at this time of uncertainty, make the same requests as do other organizations for recognition in governmental office, and in view of the further fact that not since the adoption of the present constitution has a representative of the agricultural and business interests occupied the gubernatorial chair, and further recalling the successful and untarnished record for six years as a member of the Legislature, when, as Chairman of the Agricultural Committee he rendered most efficient services, and further remembering his career of seven years as Deputy Secretary of Agriculture, where with untiring energy he has so organized and administered the farmers' institute system of Pennsylvania as to make it second to none in this country, and believing that he would draw to his support the agri-

cultural and business interests without regard to party affiliations, and that in harmony with his previous record, he will administer the duties of the executive office of this State with honesty, efficiency, and to the best interests of all parties, therefore be it,

Resolved, That it is with pleasure we note that calls are coming from various sections of the State that Hon. A. L. Martin become a candidate for Governor, therefore, we most heartily endorse him as the candidate of the agricultural interests of the State.

These resolutions unanimously recommended by the Committee.

(Signed.)
SAMUEL McCREARY, Chairman,
FRANKLIN MENGES, Secretary,
T. E. ORR,
MATTHEW RODGERS,
AMOS B. LEHMAN,
D. A. KNUPPENBURG,
M. N. CLARK.

The CHAIRMAN: The resolutions are before you; what is your pleasure?

It was moved and seconded that the resolutions be adopted as read.

The CHAIRMAN: You have heard the motion; are there any remarks?

MR. AGEE: Mr. Chairman, I want to say that I am very glad that the resolutions refer to the needs of the State College. The trustees of the State College I know propose to develop the agricultural end as much as the engineering department and mechanic arts. It is in the hands of the farmers of this State to do it.

Now I know that some of us have felt in the past that we have not had at our State College as full recognition of agriculture as we should have. It is within my knowledge that the executive committee are determined that the agricultural end of the college shall be developed, and I want the support of the farmers of this State for that week. If we have a farmer's week at State College I hope you will make an effort to attend and you will give an interest to that meeting, and to the work of popularizing agricultural education. We are not working just for this generation, and unless you people in your institute work teach the boys in our homes, give them better instruction than we received, these institutes will not have done one-half the work that they should do.

Professor Van Norman told me that they are hunting the United States over for the most distinguished specialists. They want to get men like Professor Holden, of Iowa there during that week, and have a talk on corn breeding, and similar men all along the line in other departments. Let us advertise that week, and get our Pennsylvania farmers interested. I say that because I feel that I am at least part Pennsylvanian; get the people in the audience interested and let them go up there, and if you do that, you will get a greater influence to bear upon the trustees of the institution, and I want to say to you that good men are going to be brought in, and in five years from now, State College is going to be a leader among the agri-

cultural colleges of the nation. I hope you will advertise Farmers' Week all over this Commonwealth, and let us take a new start and let us make the State College the great institution it should be.

The DEPUTY SECRETARY: Mr. Chairman, I have listened with great interest to the resolutions that have been presented for our consideration at this time. The one resolution, my friends, referring to the last seven years of farmers' institute work in which mention is made of the work accomplished and the confidence therein expressed and reposed in whatever part I have borne with you in that work, is esteemed and valued by me more than all the other resolutions or than any resolution that could possibly be presented, for, my friends, the man who undertakes to serve the public to-day in Pennsylvania is a failure unless he has the whole, heartfelt confidence of the people in whose interests he labors and I esteem that expression over and above all others.

Mention has been made of the highest office within the gift of the people of Pennsylvania. For many years I have been impressed with the thought that agriculture, the base upon which every other industry and occupation and business rests to-day ought to be represented in the highest position, and while I believe that the interests of agriculture are entitled to such representation, I have not dreamed nor do I dream now that my personality can enter into view in that connection.

As you are well aware, my friends, conventions nominating and presenting names for the governorship are already partly consummated; one is held to-day, another next week, and another a few days later. You are aware of that, and that delegates are already elected, therefore I take it that the resolution in question is scarcely intended for more than the presentation of an expression of your will upon this point and question.

For the past many months questions of this kind have been presented to me and I have repelled them and have not considered them, but I want to thank you for the honor you have conferred in presenting my name. I shall go away bearing with me the recollection of your kindness and confidence as shown by the expressions in these resolutions.

MR. HERR: Mr. Chairman, I would like to emphasize one of the resolutions you have heard read, and I would like to have our people aroused to its importance a little better than we are, and that is for the maintenance of State College. I said something about this on Tuesday morning but I know there are many here now who were not here then. Speaking for the trustees, several of whom are present, and they are all of one accord, I want to say that they are doing all they can in the way of advancing the agricultural end of the college, as my friend Agee has stated, but if we are to do it we must have something to do it with, and it is up to you as influential citizens all over the State to see that we shall have these funds.

We want to elect a Legislature which will consider the claims of State College and give us maintenance funds. Maintenance funds which sufficed two or three years ago to care for two or three hundred students are not sufficient to care for a thousand students which we have, or will have in the very near future, and the appropriations that we have received from the State have been so specific

that we could not use them for maintenance. We need an appropriation which shall not be specific, but for general maintenance, and large enough to meet the need, and then we will bring up this agricultural end, and place it where it should be.

Then we want to elect a Governor who will not cut the appropriation in two and give us only the half of it. Only give us the material that we need to work with and you can depend upon it that we will do the very best we can for the agricultural community.

MR. KAHLER: Mr. Chairman, I know that it is customary in nearly all associations to present resolutions. They are presented and adopted and that is about the last of them. I think the time has arrived when if we express our sentiments through a resolution, it should mean something. We generally embody in that resolution what our wishes are. I think you will all agree with me that nothing can be effected in the legislative line in the interest of the State College or in the interest of reform in any way, unless you create a sentiment for it. Now how can we do that? I think it is up to us, as has already been said, and that the time has arrived in agricultural education and in many ways that we make manifest our wishes and desires and give the State to understand that we mean it.

Now in this association, with representative men from nearly every county in this Commonwealth, let us not just merely direct the adoption of this resolution, but let us create a sentiment at home, and I tell you that the politicians can't withstand the sentiment behind it. There has been nothing said or done here on a partisan line; we have had a confounded sight more partyism than we have had of wholesome laws. I am for the man who will stand for us, I don't care what party he represents. I want to know what he is.

MR. BRODHEAD: Mr. Chairman, I would like to ask how many men in this audience own horses. Hands up. (Many hands were lifted.) I wanted to get this vote for information. I am traveling over this State and some others and I have found that the horseshoeing interest is retrograding. The horseshoer used to be a power in his neighborhood. There is another thing I want to know. I want to know how many men here know of men learning the horseshoeing trade under twenty-one years of age. (Three or four hands were raised.)

I was in fifty-four shops in the State of New Jersey a year ago last winter and found only three solitary men learning the trade. I havn't found a man in two years trying to learn the horse-shoeing trade. Our business has been brought down and our fellow-craftsmen have lost their interest and only learn by what they pick up here and there. There is not a place in the State of Pennsylvania where a man can go and get any anatomical knowledge to fit him for the business of horseshoeing whatever. We have to pick up just what we can. I have tried to get State College to take this up and give our young men an opportunity to get an anatomical knowledge of the horse's foot and leg.

I hope that this resolution, when it goes before the legislative committee—I hope they will do something to better our condition and better your condition. The day is not far distant when men

who own horses will have to do their own horseshoeing if they want it properly done, and they will have to learn how to do it.

I thank you for your attention and I hope that we may have something done to better the condition of the horseshoers of Pennsylvania and the surrounding states.

MR. FENSTERMAKER: Mr. Chairman, if you want your farms all cut up just make common carriers of the trolley roads and give them the right of eminent domain. That is the reason why I am opposed to these resolutions covering that point.

MR. HERR: Mr. Chairman, I move that Mr. Brosius be given the privilege of the floor.

The motion being seconded and the question put, it was agreed to.

MR. BROSIUS: Mr. Chairman, I simply wish to speak for a moment upon this railroad question. The trolley has come to us and it has come to our farms, and it has come to stay. The trolley is to circle our valleys and climb our hills and the steam railroad never can come that way. A steam railway can never be brought to our farms. To give the trolley roads the rights proposed may injure some individuals, may injure the feelings of some people who own the farms and homesteads, yet for the good of the whole, we have given steam railroads the right to divide our farms and go everywhere in the State except in your homesteads. More people will be benefited by trolley railroads than by steam railroads, and they ought to have the rights which will enable them to efficiently perform the work necessary for the good of the whole people.

I do not want to go upon record nor have it go upon record from this institute that we are opposed to eminent domain for trolley railroads, because I think they ought to have it.

The chairman stated that it was important that a part of this period be divided and the period following and requested Mr. Glover to come forward and take the chair.

Dr. Conard stated that there was a course in horseshoeing in the University of Pennsylvania.

Mr. Glover took the Chair.

Prof. Menges asked leave to amend the resolution relating to horseshoers so that it might not be in conflict with existing facts.

Leave was granted and Prof. Menges, as Secretary of the Committee on Resolutions amended that particular resolution in conformity with the understanding arrived at, being authorized so to do by the motion of Mr. Hutchison, duly seconded.

The CHAIR: We will now take up the first number on our program, which as you will see is, "On What do the Dairy Profits Depend?" By Prof. H. E. Van Norman, Department of Dairy Husbandry, State College.

Prof. Van Norman read his paper as follows:

# ON WHAT DO THE DAIRY PROFITS DEPEND?

By PROF. H. E. VAN NORMAN, *Department of Dairy Husbandry, State College, Pa.*

The profit in a business is the difference between the cost of production and the price received for the goods produced. It is the proportion of the selling price which may be used for enlarging the business, or it may be paid to the stock holder, or proprietor as dividends. Without exception, all our large and successful manufacturing concerns maintain a considerable force and spend no little money to secure exact information as to the cost of manufacturing, handling and selling their goods. In many lines the margin of profit is so small that a variation of a few cents in the cost of production means immense loss.

I believe there is no business which will stand the losses and leaks that most farm business establishments suffer and still yield the owner a living. If with a reasonable outlay of time, labor, and even money, and considerable proportion of these losses could be stopped, and the profit proportionately increased, many farms which now yield their owners a bare living would show a profit to be used for the good things of life, the luxuries, comforts, and travels or entertainment.

My first point is, the dairyman should know what his cows are producing in return for the feed consumed. Statistics show that the average production per cow in this State is about 160 pounds of butter per cow per year, which little more than pays for food consumed, while Experiment Station figures, commercial herd records, and many investigations carried on among creamery patrons show herds that have produced from 225 to over 300 pounds of butter fat per cow per year. In one community, Experiment Station figures showed that 68 out of 100 farmers did not receive as much for the product of their dairy herds as they could have received for the food consumed had it been sold at market prices, while the remaining 32, by the use of silage, clover hay, better grain mixtures, care of the manure, attention to blood lines and the reading of dairy papers, secured a handsome profit over and above the value of foods consumed.

There is not only a large difference in the production capacity of different herds, but even a greater difference in the production by individuals in the same herd. One cow will produce from 90 cents to $1.00's worth of milk for each $1.00 worth of grain, pasture, and roughage, while another will consume practically the same amount and return from $1.50 to $2.00 worth, and, in some cases, even more of milk or butter. Some of the profits from a good cow must be used to pay for the losses on the poor ones, thus reducing the profit per cow very considerably. It is this great difference in productive power of different herds, and still more important in different cows, in the same herd that makes it so important for the owner to have a definite knowledge of what his cows are doing. The fact of this variation has been proved over and over. Confirmation of this statement may be found in Bulletin No. 75, B. A. I. of the U. S. Department of Agriculture.

If we accept this fact of variation "in productive power," how shall the ordinary farmer determine the yield? It will pay any man who is milking cows as a business to weigh the milk of each cow at every milking, but most men won't do this. It will pay because most milkers will strip enough more carefully to more than offset the time required for weighing. If the yield was down one-fourth of a pound or one-half pound at the preceding milking the milker will unconsciously give a little more attention at the succeeding milking, prompted by the scales that may be he did not do his work as well as he should the last time. It will pay because in no other way can the owner know definitely that each cow is doing as well as she should do, especially if he is not doing the milking himself. By means of the milk record he may discover the evidence of careless milking, and the failure of certain cows to do what they should; oftentimes this information will enable him to correct a fault and maintain a yield that will amount to a good many hundred pounds additional in a year. This is a feature of the daily record which is usually overlooked by the men content to weigh occasionally.

Recognizing that many would like the information but are deterred from keeping the daily record by the apparent amount of labor, the next best thing is to weigh the milk for seven consecutive days every seventh week, seven times during the year; this will give a very close approximation of the amount of milk produced, but will be of little value to the man who is desirous of securing the largest returns for feed consumed from day to day. If the market product is butter fat it is necessary to test the milk and know how much fat has been produced. In addition to the pounds of milk produced he must know the per cent. of fat in the milk. To secure this, procure a sample bottle, pint milk jar or fruit jar, one for each cow, in to this place a sample of each milking for seven days the same week the milk is weighed, or if weighed every day, every seventh week. With the weight of milk and the per cent. of fat for definite periods regularly throughout the year, it is but a matter of figures to know the production by each cow.

Some prefer to weigh and test the milk three days, only, each month. I prefer a longer period of seven days every seventh week, because the longer the record period the more apparent the daily variations, and the fewer times in the year will the occasional work of testing need to be done.

Most men are satisfied if they can guess pretty near to what their cows are doing. When a very successful dairyman, and president of a State Dairy Association, began the keeping of a milk record of his herd he recorded his guess as to which was the best cows 1st, 2nd, 3rd, 4th and so on. At the end of the year the one he had guessed first actually ranked 4th and the one which held first place he had put fifth in his guess, at the beginning of the year, while his second guess occupied 6th place in actual production. Records from many states show man's inability to guess accurately and therefore the need of positive records to secure definite knowledge.

While there is a difference in the value of feed consumed by different cows in the same herd, this difference in most herds will be less than $5.00 and will rarely exceed $10.00, yet the returns from the different cows in the herd will vary from $30.00 to $80.00, or to state it in another way, $1.00 worth of feed will produce less than

$1.00 worth of milk from one cow, while in the same herd another will produce more than $2.00 worth of milk.

In Denmark, associations have been formed in which the farmers co-operate in employing a man to test their cows, weigh, feed and secure this information for them. Michigan is the first state in this country to organize Cow Testing Associations, and Canada is following in the same lead. Is it not time for our Pennsylvania Dairymen to take hold of this matter? I shall be glad to render any assistance in my power in the establishment of such associations. I believe our creamery managers could well afford to give considerable attention to the organizing of Cow Testing Associations among their patrons.

Having established the fact to his own satisfaction, that his cows are not as good as he wants, how shall he get better ones? It is impossible and impracticable for most men to sell the herds they have and try to buy better ones. The best plan is to raise them for this purpose. He should procure a sire whose dam has a yearly record for creditable production, if the breeder can show yearly records for several of the sire's female ancestors, this is the best guarantee which the buyer can get, that the offsprings of this sire will be large producers. From such a sire as this, and those cows in his herd which have made good records, he should save the heifer calves, using them to replace the poorest cows in his herd.

It is unnecessary to say that the unproductive cow should be gotten rid of at the earliest possible moment. Yet I have known men to keep a cow to convert $32.00 or $33.00 worth of feed into manure, and produce only $25.00 or $28.00 worth of milk. Since manure is usually valued sufficiently high to pay for the labor and care of milking, it is hard to figure any profit in this transaction.

If a number of farmers in the same community will use sires of one breed, the time will come when each having a few heifers to sell, a buyer can procure in a community a carload, thus enabling the farmer to secure more for his heifers than he could possibly have done for one or two if they must be shipped by themselves. I believe this "community of interest" should receive more attention from the farmers in a neighborhood than it does, and lastly the profits will be materially increased if the quality of the product is maintained at its highest, indeed rarely has the market more of the "first" or "extra quality" be it cows, butter, milk, corn, or even men, than the demand, yet there is much of the time an over supply of the next grade lower, and it is quoted as "a drug on the market" or "slow sale."

Uniformity of product from week to week is of vital importance. If the public can depend on a brand of goods always being the same, it does much to insure a steady demand and insures a premium above market quotations.

A Member: I would like to ask the Professor if he has had any experience with the milking machine?

PROF. VAN NORMAN: Personally, no. I saw the American machine at the Chicago Dairy Show, and I saw the Burrell machine where they were milking some sixty cows. So far as I have seen it, I believe that the milking machine is about where the automobile was several years ago. I believe they will be improved and that

they have come to stay. I believe where good men are employed and placed in charge of the machines, that they will be a success.

A Member: They are all power machines that you have seen?

PROF. VAN NORMAN: Yes, I don't know of any small machine that has risen to any general recognition. The machine of the Burrell people has got to that point where it is getting into commercial practice. I know of a number of farmers that have put them in. They are wealthy men, it is true, but they are looking after the dollar.

The disadvantages will be, there will be some cows that will be difficult to milk. A man who will take the precautions that are necessary can keep them clean, and the expense of doing that will not, in my judgment, be prohibitive.

A Member: How expensive are the machines?

PROF. VAN NORMAN: The machine itself to do the work only costs about $75, and then there is the pipe and you have to have an engine of some kind to get the necessary vacuum and you have to have a pump. I remember one gentleman who figured a cost of $800 for about sixty cows; it was a good deal less expensive than two men.

I saw a machine milking sixty-four cows in one hour and sixteen minutes, and found thirty-two cows with less than six pounds of strippings. I do not think you can do that with men milking. I found one man who said he had discontinued his strippings, because he got so little.

I don't advise the general farmer to go ahead in the use of these machines at present; let the other fellow experiment a little longer.

A Member: I understand that Mr. Billings is operating a milking machine, and I would like to hear from him.

MR. BILLINGS: Mr. Chairman, we are trying a foot-power machine. We have been operating it for three months. It has been, we consider, a great success with us.

We were having difficulty to get help that was efficient to handle our dairy. We heard of this machine and we ordered two and brought them into our herd and they are doing very satisfactory work, for this reason; a man with one of these machines can do twice the amount of work, and he produces a great deal cleaner article than he can in any other way.

I found one man who had a machine and threw it out because he was not there to look after it himself. Now the machine has got to be looked after, to keep it clean, but it is not difficult if you are right there, and watch it closely.

With this machine, one man can milk about sixteen cows per hour. With our herd, it takes a good man to milk eight cows per hour by hand. You can sit down there and milk all day with the machine the same as you can go on to your farm and do any other work, and you are not exhausted. We didn't know when we went into our plowed fields this spring but that it might worry us a little when we got to milking there, but we are well satisfied and consider that the machine is a great success as far as we have experi-

mented with it. What we are interested in now is, to know whether by continuing the use it will continue to be as satisfactory as it is at the present time.

MR. HUTCHISON: What is the cost of the machine?

MR. BILLINGS: We paid $65 for it.

MR. FENSTERMAKER: Who is the manufacturer of the machine?

MR. BILLINGS: George Lowe Behring is the manufacturer of this machine. He has been working at this machine for fifteen years. The inventor was at my place and showed us some things about it.

MR. AGEE: Didn't you ever observe that some nervous cows prefer it to hand-milking?

MR. BILLINGS: Yes, that is another point. Some cows take it more kindly than they do hand-milking.

PROF. VAN NORMAN: There are a great many of us who would not milk for twice the income we are getting, and I believe this. When the milking machine is perfected, it is going to make it possible to employ more intelligent men for the work, and we are going to be able to pay a higher price for more intelligent men.

MR. BILLINGS: I would say this, that if you put in one of these machines, you have got to hang to it a little while, or else you will discard it before you know what it is. We had to work something like two to three weeks before we got everything satisfactory. Some of the people who have bought them have discarded them in two or three weeks, simply because they did not stick to it until they knew just how to operate them.

DR. DETRICH: Mr. Chairman, we have looked quite carefully into the milk machine question for other people, but the real objection to the machine is, the jealously which people have towards the instrument. They don't want to use it. They had a terrible time with the help at Berkley's farm. The trouble is, the men think it is in opposition to their own business.

It is like the mowing machine when I was a boy. You can hardly imagine the opposition there was at first to the use of the mowing machine. If you had a mowing machine, you could hardly get a man in to help you hay under any circumstances. It is the very same with the milking machine. Everything is really in favor of that milking machine. The only thing that I can see is, that cows have different sized teats, and you have to have different sized apparatus to fit these teats—you have to have different sized cups. It is a rather pleasant operation for the cattle. I have seen it put on cattle for the first time and they took it without trouble.

It is a cleaner operation than ordinary hand milking, and the men are neater. One man can operate and milk six cows at a time.

Men who write up the machine, who are aware of this prejudice, say wait a little while, and the prejudice will disappear as it has in other instances, but the trouble is you will find that your men will make objections to it; they don't want to do this and they don't want to do that—they don't object to the machine exactly, but as a matter

of fact they don't want the machine at all, and we will have to overcome that prejudice and show these men that this machine is really for their benefit, and just as soon as we get them to co-operate with the machine, I am sure it is a go.

PROF. VAN NORMAN: How many cows do you milk with your machine at a time?

MR. BILLINGS: We milk but two; we can put on another section and then milk more. That we are going to fix for ourselves.

A Member: In our section we lost quite a good many cows by milk fever, and would it be out of place to ask Dr. Tower or Dr. Detrich to talk on milk fever.

DR. DETRICH: I would like to hear Dr. Conard talk about that. I can give my experience as a herdsman and with cattle in handling that. I will assure you this, that no poor cow will ever have milk fever. If a man has carefully watched his cows for thirty days before the cow is fresh, he will tell you just what your cow is going to be, and until a man gets his cow right down and understand the whole situation, he will have trouble. If you want to be a dairyman, you have got to get down to business, and you must know your cow thoroughly, and if a man does not want to get down to that business and study it until he understands it, let him quit the business.

There are other diseases as well as milk fever, that will demand the attention of the dairyman. Milk fever always comes from careless feeding. You get a fat cow, if you take care of the cow and feed her with the right kind of feed, you will have good results and plenty to go into the bucket. If you handle your cow properly and keep her on proper food, she will come along all right, but you must have an eye to know the cow. A man has got to have an eye for the dairy business in order to succeed. It is just like a man trying to play the violin, like Ole Bull. If a man has no eye, just as like as not he will kill the cow.

I don't care what you say about dairying or about handling cattle, a cow must have an udder, and that udder must be filled but you don't want to carry it to excess. When it comes to milk fever, you feed the cow with bran and hay and water ten days before she is fresh, and if she is not making a bag, see that she gets an udder without fail, and then give her a little salt for ten days. Her manure must just be right, for after all, the udder of the cow always follows the manure; if the manure is right, I will guarantee that the udder is right. You can control it to a very great extent just by watching the droppings. You must look and watch every day. Dairying will never be profitable until a man knows how to handle the cow's udder. The whole system must go together. When you have your eye and your hand and your feed and your cow and your weighing machine, then you can commence with the probabilities of success in your favor in the dairy business but not till then.

DR. TOWER: Mr. Chairman, this subject of milk fever is one of pretty broad import. What the gentleman has just said is important, but if we carry this a little further, we will find that milk fever will sometimes occur no matter what you do. I don't believe there

is any rule by which we can avoid milk fever in every case. Now a few years ago we used to think that milk fever was one of the most deadly diseases we had, and so it was at that time. A great many different remedies were proposed; most everything was tried to stop it. We gave them large doses of physic in some cases, and some gave them large doses of aconite and we found that it was the same with this disease as with other diseases. Once in a while a cow would live in spite of what you gave her; I guess that is the way to say it. If a man had a case of milk fever and the cow lived, he ransacked his mind to know just what he gave that cow; then he thought he had a specific and was ready to swear by that in every case. Then a method of treatment came into effect which saved a great many cows. It was thought that the iodide of potash which we injected into the udder, did the business. Now I think that Dr. Conard will bear me out in the statement that it was the air that we injected into the udder that did the work, instead of the medicine. If you get this little instrument that we use for injecting air into the udder and use it in time, and in decent shape, you won't lose one out of fifty.

I know this, I have had within the last two years something like seventy-five cases of milk fever without losing a single case. That is a pretty good record. I don't say it to boast, but I say it for the benefit of the treatment.

A man called me up on the 'phone a little while ago, and he said he had a cow that was very sick with the milk fever, a cow worth a hundred dollars, and he said, "What shall I do?" Then I asked him if he had a bicycle pump. He said he had, and said he, "What are you going to do?" I said, "I want you to give the cow air." He took it as a joke. I told him to take the milking tube that I had left with him a few days before, and instructed him how to proceed to get air into the udder. I don't recommend the bicycle pump in the treatment of milk fever, but I simply say this, if you can't do any better, sterilize your bicycle pump or any other pump and get the air into that cow's udder, but a man who has a dairy is very foolish not to have one of these instruments which are made on purpose for treating milk fever. They can be bought for $2.50 and any farmer can handle them. I do not wish to take up any more of your time.

DR. CONARD: Mr. Chairman, I agree with every word that Dr. Tower has said, and I was exceedingly glad to hear him say it. Every dairyman should own a pump or a little outfit for the treatment of such cases. It is very important that the treatment be administered quickly. There are some cases, if they continue too long, the poison will become so thoroughly diffused throughout the system that they may not recover; an early treatment is very much the best.

I just want to explain; I think that the Reverend Detrich spoke of feed producing milk fever. I just want to go a little further into that, if you please. I don't quite agree with him without some modification. The feed may produce the conditions which make fever—milk fever—but the feed of itself will not produce the disease. A cow that is well fed with succulent food, bran, ensilage and such food as would produce milk and before the time of par-

turition her udder is largely developed, and is producing a large amount of milk. If she is a young animal, that udder is a larger per cent. of that cow's being or that cow's whole body weight, than it would be if she was fed on any other kind of food, if the udder was not quite so well developed, was not so well filled with blood and was not such a good culture medium for germ growth, for I believe we understand that milk fever is the result of the growth of an organism in the milk ducts of the udder which produce a poisonous element which is carried through the system by absorption, so as to become and is, poisonous to the animal, and produces a paralysis. Now if that udder is of a smaller percentage of that cow's weight, if it is not developed so well, her resisting power will be more able to overcome the attack. Suppose that the udder was one-fourth of her whole weight then her resisting force would be as three to one, we might say, but suppose it was one-twentieth part of her weight and the resisting force would be as nineteen to one, so that it is the food that puts the animal in condition to succumb to the disease when it is present; it is not always present, fortunately. As to the sterility of the instrument used, it is very important, and that is the only objection to every man possessing his own outfit, and if he is thoroughly aware of the importance of having everything thoroughly sterile, he is just as competent to do the work as anybody else. I think that nearly all the cases followed by garget are due to the introduction of some poisonous matter into the milk ducts. The milk tube is a very dangerous instrument to use; it should never be used at all without being thoroughly sterilized, and that sterilization should be done immediately before its use. Boil it immediately before using; if it is not sterilized at that time, and sterilize it after using, for you don't know just what may come in contact with in using it, and it is one of the best incubators of disease you can find.

DR. DETRICH: Mr. Chairman, I would like to say one word. There is such a difference in drying a cow off. You go into a dairy barn and you will say "Is this cow dry?" "Yes, we have quit milking her." Now to quit milking a cow does not make a dry cow, and that is the very thing that will create germ after germ in that udder. I don't think there is a more reckless thing to do than to carelessly allow one-fourth of the milk to stand in that cow's udder.

I agree with Dr. Conard that the use of a milk tube is a very dangerous thing. You seldom get persons to sterilize milk tubes as it ought to be done. To sterilize is the thing to do, and if you have your boiling water to dip this plug in, and then take it out, and then put it right back into the teat again, with little cosmoline, and dry the cow off without a doubt before you prepare her for motherhood.

If your cow is not dried off properly, you may expect all kinds of trouble. I heard a man say a while ago "you can't milk a cow dry." You give a cow nothing but timothy hay and water and you can dry that cow off. As soon as the cow is dry, commence to feed her. Give her so many quarts of bran a day and so much timothy hay. Watch that cow's system. Give her something cooling. Give her no milk-producing food unless it is really necessary. Use linseed meal; never give her cotton-seed meal. Keep her on a feed of

timothy hay, bran and linseed meal and water, and give the cow as much exercise as you can. Stand back of her and feel her short ribs. No well fed cow will want to walk, but make her walk, and give her the exercise, and I will guarantee you won't have milk fever on the farm.

DR. TOWER: Mr. Chairman, it is quite customary to think that they must do something besides giving this treatment with air; they think they must give medicine. I have known of two or three cases where the veterinary went away after doing what was necessary, and they went and gave them a lot of medicine. In the case of two cows, they both recovered from milk fever, but they died of pneumonia afterwards. After you give them the air, let them alone. If you go to pouring medicine down them, it is just as liable to go on to the lungs and cause your cow to die from pneumonia.

Adjourned to one o'clock P. M.

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Court House, Clearfield, Pa.,
Afternoon Session, Thursday, May 31, 1906.

Mr. Glover in the Chair.

The meeting was called to order at the designated hour.

The CHAIR: We will now take up the second number on the program for this morning entitled "Feed, Breed and Care of the Dairy." By Dr. J. D. Detrich, West Chester, Pa.

DR. DETRICH: Mr. Chairman, Ladies and Gentlemen, and Fellow-Farmers: It is a very great pleasure to me this afternoon to stand here and speak to you on the subject of "The Feed, Breed and Care of the Dairy," but before saying one word in reference to this subject, it is my delight to present to you at this time the very splendid address that was delivered by the President of the United States yesterday at Hampton, Virginia, and he spoke of the agricultural colleges, and the work which the agricultural institutes are doing for the farmer, and urged the young men of America, colored men as well as white men, to stick to the farm, and I am happy to be able to present to you this suggestion from the President of the United States, and such good words for the advancement of agriculture, for we know very well that we do not have the sympathy of everybody in the United States, and sometimes we feel that we are pulled down by the tremendous tide that is trying to draw us away from the scientific side and down to the ordinary method of practicing agriculture in the past.

Still further, I bring to you the greetings of Mr. Kates—those of you who were present at West Chester last year will remember him well, and he wished me to say to you, that if you would come to see him again, he thought he could offer you some good milk to drink instead of some of the other stuff.

Dr. Detrich discussed his subject as follows:

# FEED, BREED AND CARE OF THE DAIRY.

By DR. J. D. DETRICH, *West Chester, Pa.*

Speaking of the care of the dairy cow, the first thing is, undoubtedly, the feeding of the dairy cow. Of course you have to have your cow before you have to have your feed. We understand that grass was created before the animal, so that we consider that as a matter of course. Afterwards comes breed, second, and the care of the animal next.

There is another phase to this business of dairying which belongs to the handling of the milk and to the marketing of the milk, a question which belongs to the commercial side. You can dispose of it through a milkman, or if you are conveniently situated to do so, you can market your own product. Not every farmer is situated in that matter so as to send his milk directly to the consumer; therefore it is the duty of every farmer to become a business man as well as a dairyman.

## FEED.

In speaking for the dairy animal, and believing that the grass was created before the cow, we likewise have to take hold of the subject of the feed for the purpose of handling the dairy business properly. There are several systems that have been in vogue, looked upon as more or less extravagant, and usually conducted more or less on an extensive scale. First, there was the system of pasture, the roaming of cattle out on the plains where there were no fences, and then coming down to the day of fencing and to the keeping of animals within certain bounds, and they have calculated that it takes five acres to keep a cow within the borders of civilization and advanced society. The position which society occupies to-day as regards the variety of the products and its demands has driven the dairyman upward all the time. It will not do to feed the dairy animal on mullen stalks and weeds and all kinds of trash, and then expect her to produce a good product. This animal has to have the very best of food, and to this subject we direct the attention of the twentieth century dairymen who are looking to agriculture as well as to the dairy to-day for a business as well as a profit, and in such a way that they are endeavoring to grasp all the conditions of the question of producing milk and the various stages of its production; and they must not only consider it from the point of view of the dairyman, but also that of the sanitarian.

Well, there were millions of acres of range that animals were permitted to roam over in the past, yet every year as civilization advances and the population of the earth becomes greater, the conditions change. You would think that the dairy animal would be driven further and further away from society instead of drawing nearer to it.

Now as to the question of food, instead of having one kind of food, we have to-day a whole multitude of foods, scarcely an industry opens up to-day that we do not have a benefit derived from it in the way of a by-product. Look at the oil mills to-day, linseed

as well as cotton-seed. They all tell the story of these by-products which are coming up in such a way that they are splendid dairy foods, whether they come from the flour mill, the linseed oil mill or the cotton-seed mill; they put upon the market foods that can be fed to such an advantage that you can continue increasing the milk rather than simply to have a cow that you can milk for a few weeks after she is fresh.

The dairy animal was fitted to give milk so long as she nurtured her calf, but we have succeeded in changing the dairy cow entirely around. You take a cow that is properly handled under modern methods of dairying, and you have a very different animal from the one that used to be permitted to roam over perhaps a hundred acres in the field.

Take our dairy cows to-day, after they have been fed properly in the barn, and I let them out upon a rich pasture of growing grass, they would refuse to take a mouthful of food. You would say, it is unnatural. It is, in one sense, but what difference does it make if you provide the animal with superior food in your own dairy farm and in your system of handling that animal, have a profit, whether she eats grass or something else, and if you can bring that animal into such relations and conditions that you can afford to feed her a concentrated food from these by-products, why that is what you want and we have simply hinted at it. If you can balance up a ration in such a way that this cow will keep alive on this ration and the surplus she puts in the bucket, that is the verification of the method, and it is simply a business proposition, as much so as anything can be, and the whole thing is, to study the animal, to find out on what she thrives the best, and what is best for her.

Take those cattle at St. Louis. They tried different ways of feeding them, and you have heard me speak time and again insisting upon the right method of feeding the dairy cow. When they tried it at St. Louis and experimented upon different methods of feeding, what did they find? They found out that they had to come right back to cut hay instead of feeding long hay; found that they had to make up a regular mixture with hay and ensilage and grain to keep those cattle upon their feet. We know that is the only way, from experience. We are in the dairy day after day and have studied all these conditions; I call that common sense. To milk a cow seven months in the year and then let her lie simply fallow, to have a cow fresh in the Spring and let her go dry in the Fall, these are the methods that you are to consider.

We turn a cow out to grass in the springtime and let her go dry in the Fall, said some of the people when I was up there. They said the truth is that the milk gets so scarce up there in the winter time that we have to raise our babies on cider.

Situated as I am in the dairy business on a large farm and having no place for growing our own cattle for the first year or two, I was obliged to go into the market to buy a lot of cattle this Spring, although the Fall is the better time for buying cattle. In the Fall many persons have cattle running out and grazing, and then as winter approaches, and they realize that they will have to put them into the barn and feed them through the winter, they think that they had better sell and that is the reason why you can usually buy cattle at better advantage in the Fall of the year than you can in

the Spring. I was perfectly amazed when I went into some counties to buy cattle, and I could scarcely believe that modern farmers would be guilty of practicing such methods and still would go to church and claim to have common sense and self respect.

It is a strange thing that any one in charge of animal life will permit it to stand out in sheds or barns in the condition that I found these cattle. You might as well feed them on fence rails, and yet some of these people told me to my face that they fed these cattle grain. Why, it was difficult for them to stand up, much more difficult for them to produce milk, covered with all kinds of dirt and afflicted with disease; it is a wonder they were alive at all—yet these animals were called cows. There was no possibility that any man making a business of dairying could succeed under such conditions. It is a perfect outrage on society that such things should be. Talk about cruelty to animals; there is nothing more cruel. You can beat an animal and give it a tremendous beating and it is soon over, but to keep an animal standing in such condition for six months, practically in a state of famine and starvation, so that you can count every bone in its structure, why the very condition of the animal is changed, the very condition of its whole system is in such a state that you take that animal and put it into a good barn and attempt to feed it a balanced ration and you are defeated.

I thought I had studied the balanced ration pretty thoroughly and I thought that I knew pretty well how to handle an animal. I thought I could take these cows and put them into a barn and commence to feed them ensilage and cotton-seed meal, and that these cows would respond to such treatment. But no, they would stand and look at the ration as though they had never seen any think like it before; they looked at it as if it was merely so much sand.

Now what shall we do with such animals? It was a problem and how did I solve it? I went to the corn crib, got nubbins and they ate them greedily. Imagine Detrich standing up before a lot of such cattle and going up to a corn crib for a bushel ration and getting out nubbins for a lot of scrub cows, cows so poor that you could count their ribs on each side, so thin that the wind could blow through them, in fact, in a perfectly horrible condition. And yet what did the people want for them? Why, they wanted the price of good cattle for them.

Look at the argument, and yet men say there is nothing in the dairy business; and I agree with them. I agree that no man will ever make a success out of such a dairy business! It is impossible for any man to do it. Then look at the cattle; talk about a scrub cow and a scrub sire; put them together and you get something still more scrubby, and then they feed them this miserable feed or no feed at all and call it the dairy business. No one can ever enter the dairy business and flourish under such treatment as that, and that is not an overdrawn statement either of what I found, and my own experience this winter in buying seventy-nine head of cattle, confirmed it, whether I went into one section of the country or into another, I found the cattle to be in this impoverished condition and the people that owned them were complaining that farming didn't pay; their grass fields showed it and their barns showed it, and they themselves showed it, as additional pictures of this famished condition of their dairy business. They never heard of a balanced ra-

tion; they wouldn't know it if they saw it, and they keep their cattle in sheds where there are just a few fence rails put up on each side with a lot of sticks on top. No doubt many of you have seen just such a cow shed as that. I said to one of them, "What do you want for your cow?" He said "Forty-five dollars." Why, I laughed at the man; the cow would have been dear at fifteen dollars. I saw a stable not very far from the center of this State in such a condition that I would not have given twenty-five dollars for the whole bunch of twenty-five cattle, in fact, I wouldn't have driven them home. The cattle were in a state of starvation; you couldn't have got them on their feet for three or four months. No cow is going to milk well when she can't shed her coat and she is liable to any and every disease. You are just as likely to run into garget as not when you are going to feed them with their whole system impoverished and their circulation and skin gone wrong. You take a cow and her circulation is bad and she just stands in that shriveled condition with her back humped up, the worst possible condition for a dairy cow. The dairy business will never flourish and succeed anywhere under such conditions as those, and it is foolish to expect it. You cannot possibly bring it to pass. If you have scrubby animals, and then feed them scrubby feed, they are going to be the scrubbiest of things. On the other hand, you take a balanced ration, and have your cows balanced, and still more, the feeders balanced because an unbalanced man is the most fortunate of the two—I would rather have a balanced man than a balanced ration for a feeder, because he will know what the cow needs, and he will succeed, while if he does not know that, he never will succeed, whether he sends to the college and gets that ration marked out for him, just as nicely as it ought to be, whether it is a narrow or a wide ration, if he is not master of the situation and master of the individual animal, he will never feed that animal properly. He may feed her, but for the dairy business, he certainly will not succeed. He must know how to adapt his feed to the business and to the animal.

In looking then at the impoverished condition of some of the cattle which come into the eastern market at certain times of the year, if they were fed twice as much as they usually feed the whole bunch of them, they would be in better condition and in every way be better. You cannot get a cow into a real working condition in that impoverished state in less than three or four months, and what does that mean? That means four months of wasted time, or three months of wasted time because that means neglect and carelessness of the man who owns the animal. It is the man who is to blame in every respect. It is the man that makes the cow. It is not the cow's fault if she is bad; he has bred the cow; she has not. It is the man's business to use his intelligence to breed and feed the animal. The whole position puts the man in such a relation to the animal that he is not only the master of the cow, he is the keeper of the cow, the breeder of the cow, and the feeder of the cow.

Now what should we do with the dairy situation as it is in this country? We must provide the foods that to-day are in the market. You can have brewers' grain or malt stock if you want, or the refuse from the cotton mill or linseed mills, any one of them you can take them and balance them up to keep the animal alive and feed her enough besides to make you a profit, but if you are going to turn

your head, and say it doesn't pay, and turn your head away from the animals, and say, I don't care, I am not going to bother with cows; they are too much trouble. Don't attempt to keep a herd of cattle unless you make yourself master of the whole situation. Study the cow's whole constitution and understand your individual cows.

You can't take some old thing that has no nervous system and make a cow out of her; she must have a splendid nervous system in order to make a good dairy cow out of her. If you take a cow with a poor nervous system, you will never find one such cow to turn out to be a great dairy cow.

Take a horse that has the right shaped head, and well knit, well proportioned body. He has courage for any service that you want him for. Take a dairy cow again and look at her constitution. If she has a good nervous system, you may take that one friendless cow on the farm and take a shovel and go and dig it into her and never think of stroking her face and never think of stroking her hair the right way at all, but rather always the wrong way, when you do stroke it, and you will not have a good dairy cow, with such treatment as that. What is milking but simply taking so much vitality from the cow. When you begin to milk, you should commence to coax the cow, and learn to flirt with your cow a little; she will never fill the milk pail for you until you do. It is astonishing what a sympathy there must be between the dairyman and his cow. Just watch what she will eat and not what she leaves. Just feed her so that she will always eat it up nicely. She should not be confronted with feed that is not agreeable to her appetite. There is a foolishness in it you may say. Well, yes, I will admit there is, but there is also a profit in it, and the profit that you derive from the dairy animal under those circumstances will continue to enrich your farm, and the cow will continue to fill your bucket, and you will get the results that you are after. A man will say, "It costs too much to feed a cow in that way." Now what is your experience in the matter? Day before yesterday I had a spreader drive on the scales and the spreader contained a load taken from thirty-three cattle, and I had 2,650 pounds of manure on that spreader from the thirty-three cattle; it bore out my calculations splendidly. A good cow will make forty pounds of solid manure to add to the fertility of your fields, and thirty pounds of liquid manure to add to your fields when she is fed properly, and she will give you from twenty-five to thirty pounds of milk. Now look what you are wasting when you throw that into the barnyard. What is manure but plant growth? I would just as soon talk to a stone wall as to attempt to argue with a man who does not take as good care of his manure as he does of his milk; he is no farmer.

I regard a man as a merchant when he is like John Wanamaker; when he takes an old freight depot and starts a store in it, and fills it up with laces and silks, and studies his business until by and by he builds a proud marble structure eighteen or twenty stories high; I call that man a store-keeper; I call him a merchant. He knows his business. When a man takes care of his dairy as well, he will succeed. When a man takes off a crop of rye in May, I call that farming. When he puts in his grass seed in August, when the next season turns around, and he takes off two tons to the acre,

and in about five or six weeks takes off two tons more, I call that man a farmer that does it, and the man who simply cuts off and scrapes off white tops and mullen stalks, does not deserve the name of a farmer. You cannot possibly, under any circumstances under God's heaven, expect the dairy business to hold you up as a farmer or to furnish you as palatable food for infants or for society to-day, if you attempt to feed any such trash, and I don't see how you can attempt it and call yourself a good citizen of the United States.

The dairy business is a valuable one. There is no food on this earth so valuable and so nutritious for the infant, for the sick, for the hospital, as milk, and if a man is a true farmer or true dairyman. he would try to make better milk, and if he made better milk he would increase the consumption of milk just in proportion as it becomes improved and better, and a richer article. He would enlarge his business in that way, like John Wanamaker with his old Market street store starting as a freight depot and winding up with a marble structure; that is what the dairy business ought to be. There is nothing to-day that is taking its rise like agriculture in America; nothing stands higher than the business of the husbandman; nothing in the history of the world as we understand, stands higher than agriculture even if you go back to the days of Artaxerxes and Alexander the Great.

When Van Pelt commenced to experiment with the feeding of his Jerseys out there, he found there was nothing like making a proper combination of foods; for instance, if you have flour and water and fruit, and are going to take these ingredients to make a cake, you take your fruit and eat a little bit of this and a little of that, and you taste the sugar and it is just the same when you are going to make a pie as it is when you are going to prepare a ration for a dairy cow. Make your food rations so nice that you will tempt the appetite of the dairy cow to eat it. Take some hay; it is just as necessary for a cow that is a ruminant to have hay as to have anything like meal. Try to feed her nothing but bran or nothing but corn meal and see what will become of your cattle. Your cow must have cut hay, and have her cut ensilage and don't just throw it into her in any old way as if you were feeding her with white tops and mullen stalks. You want the very best clover that your farm can grow. You must have such elements down in your soil as phosphoric acid and potash, so that the plants can convey it to the animal. You start away down with a little plant, look at the difference between the various kinds of plants. Take an apple on the tree, a little knotty, stunted thing that grows in the shade and on a weak limb, and take one of Dr. Funk's splendid Winesapsand put it alongside such a miserable dot of a thing, with a worm in the end, and put it on your table, and compare it with the lucious Winesap. Now it is just the same with the cow. There is hay properly cured, and hay not half cured. You allow it to ripen properly and there is not a cow in the world but will eat it. No cow can digest a clover seed nor any grass seed, but you take it in the condition when it is just worked right and cured right and the food flows right into the plant. You get the potash of the soil. It goes up into the plant and you have a most succulent hay, with the succulence not burned out of it, and you prepare this with the best ensilage, that is, cut hay and use some bran, winter bran, some hay, and the linseed and the gluten

and you will make a complete ration for the dairy cow and make it really palatable for her. Don't say, "I salt my cows twice a week." How would your pie taste if your wife should say, after you had eaten it at dinner, "Go out and lick some salt in the kitchen." You are touching the animal on a very tender point. You let a little bit of grease get into that ration and see how quickly she turns her head away. You say the old cow won't eat that. No, and she ought not to eat it. You must adapt the ration to the cow. The ration may be splendidly digestible, but not palatable for the animal, and that is just what you have to test, and find, and choose, something palatable for the dairy cow.

You may take an animal in a certain condition, and you have a certain problem before you to learn the peculiarities of that animal. I know there are some people who think they are smart, and who shake their heads violently when this is suggested simply because they think that a cow is a cow, but you can't make a cow's milk rich on corn meal. The whole truth is this: You can do it in some instances. Some cows are in such a condition that you could not do very much with them until you get them in proper condition, and then when they are in proper condition, you talk about the lazy old cow, and you talk about the eight-hour man and the sixteen hour-woman. Why, they are not to be compared with the work of the cow, milking fifteen or twenty quarts of milk a day. She uses up more nervous energy than the horse on the street. She is using all her power. She gives us her power.

The trouble is the milch cow has usually had too much exercise for the profit of the dairy. When properly fed and watered, she won't go around exercising. Why? From nature and constitution and her four big stomachs, and she wants to chew her cud, and she rolls that over and over in her mouth. She wants quiet. A cow has that advantage that after she swallows, she commences to chew it over and over again. There is no more peaceful sight in the world than to see a cow that has been properly fed, with a real glossy coat and a splendid circulation of the blood, with a nice pliable skin, quietly chewing her cud, grinding it into the lacteal fluid that is afterwards to supply food for all human life. When you see these fine babies that have been nurished on her milk you begin to realize that there is nothing like the dairy cow. You may talk about the American hen, which is all right and proper, but there is no comparison to be made between the hen and the cow. You don't want a cow for beef, half steer and half cow; you don't want a cow either that is half cow and half goat. You want her to be a cow all over, the outside just as valuable as the inside and the inside just as valuable as the outside. Unless you know both sides of your question, you will never be a dairyman, and if you are a dairyman, you will find that there is a constant problem presented to you for solution. Every year that I have spent in the cattle industry has taught me that I have more and more to learn. I get letters time and again from people who want to take up dairying as a business. I got a letter only a few weeks ago from a gentleman who is Professor in a Virginia Seminary, saying that he would like to place a young man under my care and if I would receive him he would be very much obliged. I wrote a letter saying that I would, and the young man turned up shortly. When he came I asked him if he was fond of

cattle. Yes, very. Are you fond of chickens? Yes, very. Well, let us go to the dairy barn. We went out to the dairy barn, and I commenced to instruct him along that line, and he turned around and said, "I didn't know there was so much to learn about cattle." "Oh," I said, "You have not learned it all yet," and as I explained further, he said again, "I didn't know there was so much to learn about cattle. I thought you just fed a cow and got her milked, and that was all there is of it. He said, "It's a good deal of trouble, is it not?" "Yes," I said, "there is a good deal of trouble about it;" but I said, "This cow has to work here for 365 days in the year." A few days afterwards he wrote a letter home to his father that he wasn't feeling very well, and that he had a headache. His father came on and said his son was not very strong and that he would take him home. Now that boy will never make anything. You often cry that the boys leave the farm. Well, if they are like this boy, let them go; we don't want such stuff, and the quicker you get rid of that sort of material the better it is for the cow and the better it is for the farm, too.

Speaking of the dairy cow from these standpoints then, you can see very well what we think is necessary in their management, and as I have said, one of the chief things is, to provide this food in such a palatable way that it will tempt the appetite of the cow. The reason I insist upon this method of preparing the food is, that you will get the best results from it.

Now let us turn for a moment to the other side, and suppose that a man says, "I am going to feed the cow hay in the morning, and then I will give her some bran and gluten meal." The hay drags down under her feet, and he lets it remain there and then goes to feeding his other foods: Can you afford that? I can't. Wouldn't it pay you to put in a little bran when you feed her the dry feed? You will note that she dips into it greedily; perhaps she looks around this side and that side of the trough, and finds the bran is on either side. Suppose you have a hundred cows and are giving each one an ounce of bran. It is easy to figure out that if for each cow you feed an ounce, having a hundred cows, you cannot afford to have it wasted as I think is frequently the case. Now you want to prevent that. How shall you do it? You mix up the rations of the cow, hay, ensilage and bran, and put it before her in a proper way. She dips her head down and perhaps she will pitch the whole thing out. Now just put a stick across so that she can't pitch it out. We feed in a long trough. Ask Dr. Conard what he thinks about it. As the State Veterinary, Dr. Pearson, what he thinks about it. Ask any of the expert feeders of the country whether that is the way to feed a cow. In a lot of cows this cow is giving fifteen quarts of milk, and this one pretty near dry and that one past dry. Why, gentlemen, there is no more stupid feeding than that. You must have a system. I know it has been a main reason for failure in the business, such work as that, because of the carelessness connected with it. You can't afford to be careless. You can't afford to buy bran at a cent a pound, and cotton-seed at a cent and a quarter, and then allow it to go to waste, and let cows throw out 300 ounces of food a day. It goes right out into the manure pile and you can't afford to do it. You must so handle that food that you get returns in the way of milk or butter for every fraction of it. In the handling

of the food it is not simply enough to have a system of feeding, but there is a great deal in the way you handle the dairy cow and treat her as she stands in the stall. How often on the farms do you see some rough hired man go to milk a cow and he comes up to her and says, "Stand over here, you old thing," and he hits her alongside of the head to get her in shape to milk, instead of giving her a soft stroke down the back, or perhaps he goes at her with a real rough, new sharp curry-comb, and rubs it roughly up and down and along her sides and calls that currying. That is not currying, and no wonder with such treatment as that, that your cow does not produce the milk that she would if she was properly handled; or perhaps you neglect to brush her, or clean her off. You say she is not dirty. Now I want to say to you that a bath with a brush for a cow is just as important as a dust bath for a chicken, and just as important as a nice bath is for a good, hearty baby. Because a chicken is a chicken, does not amount to saying that it can be neglected, nor is it true of the cow. You are not satisfied when you simply sit down to a good table yourselves if you have no comfortable clothing and no comfortable heat in the room if you have the very best of food. You will say, "I am just dying for a drink, and you want the water," and so you see what it is to go through it. Your wants must be supplied; you must have comfort; you must have the water; you must have the food; you must have your bath, in order to be a real comfortable, healthy person, and it is the same with the dairy cow.

Can you make me believe that that cow is better because she roams the field, and she comes in in the evening with a little bag that is not thicker than my two hands, and you expect to get milk from her? You can't make me believe such stuff. I can take that cow and produce a very different condition, and yet you will say, keeping cows like Detrich does, it is all wrong. Every spot of land that he has ever touched and the little fifteen acre farm down at Flourtown was a hatful of money, and the man that ran it got a hatful of money for doing it. We are speaking about this from the standpoint of business.

That is not the half of it. We have only told you half, when we talked to you about the feeding of the cow. Here comes the great benefit for your farm, is getting the whole benefit of that undigested food which the cow could not turn into milk, and then isn't the dairy business paying when you can take all that you have bought in the market and after the digestible part has been turned into milk or into cream, then that which remains gives you the very thing that you want, and you know there is not a fertilizer that will compare with that manure that is made in a dairy barn.

If the cow is properly fed, you have the very same ingredients that your fertilizer bag claims to have. I would like to see the farm that can get better and better through commercial fertilizers. I can show you plenty of soil that has got better and better through the humus that comes from the dairy barn.

## BREED.

Now to speak of the breeding of the dairy cow. Some man perhaps immediately thinks that we are about to advance some fantastic idea, and that these high-priced cattle are no good, because you

can't turn them out into the fields and the storm, and they are no good because they can't stand the climate and all such things as that.

If you have a real good watch, can you throw that watch around as carelessly as you would a two dollar or two dollar and a half watch that you buy? Can you take anything of value and throw it around in that way without care?

The very fact that the dairy cow is subject to all the changes of temperature, and changes of diet shows how valuable the cow is. It just shows what a treasure you have got, and that if you will just put her in a suitable place and keep her under circumstances suited to her health, that she will work for you; a thoroughbred can always do her work. It seems to me that she is very much like myself, it would take an immense amount of comfort to kill me; the more we realize these things, the better we shall succeed in the business. The truth is, a cow that is a cow is built for the purposes of making milk and butter and when she has fulfilled that purpose, I do not care whether she is in the Herd Book; I do not care whether she has come from the Island of Jersey or whether she came from the Netherlands, or where she came from.

Yesterday it was my pleasure—I got permission to be absent from this convention—to go to Cooper's sale to see a hundred head of thoroughbred Jerseys sold under the hammer at auction. It looked like a foolish thing, but I did it. Why, I couldn't afford to miss that sale. I have been going to Cooper's sales since 1882 and I have never missed one. There is no object lesson in this world better than that, and I have never read a book or come in contact with an animal that has taught me half as much about cattle or the dairy animals as I have learned at Cooper's sales, where I have seen the finest bred animals in the world for butter and milk, stand there under the auction hammer, and knocked down to the highest bidder all over these states. There was a sale yesterday and it is a pleasure for me to tell you about it. One of the finest animals that you ever saw was put up there; her body was just the ideal body that is described by every man who lectures on the dairy cow. She had all the points that a breeder would admire, and when she was knocked down under the hammer, $2,500 was paid for that beautiful Jersey cow. No man would go and pay that for an animal if there was not quality there, if he did not know that he was buying an ideal animal. Another one was knocked off at $1,700. Just to see what breeding has done, I have followed these sales for years and always with profit. Now what was the reason of this? Why it was the prepotency of these animals. No wonder they paid such prices. Somebody said they were fools and all such talk as that. You know talk is wonderfully cheap until you go and ask a lawyer something, and then you pay for it. Those are the cattle that win at the fairs every time. You go to St. Louis or any other fair and it is the thoroughbred animal that wins the prizes. If any of you are foolish enough to talk against thoroughbreds, you belong in the class with the old lady at the market who used the same tin cup to measure out apple butter that she did smear kase, and after a while you couldn't tell the other from which. You buy all sorts of stuff and in all sorts of ways.

But I want to go back a little to speak further of what was done at Cooper's sale yesterday. They had there some heifers sired by

a very celebrated bull. They led four of his heifers into the ring at one time and I would defy a man to say which one of his heifers was the best; they were marked almost exactly alike. They went up to $900 and the auctioneer sold one at that figure and the man who bought it took the whole four. Nobody else had a chance at them.

Seven other fine animals were taken into the ring, and the bid on the first one was $500 and the whole seven were taken by the same man. It shows what breeding is. You heard what Prof. Van Norman said on the subject last night. You don't want animals with as many colors as Joseph's coat, and you don't want all this confusion in business. What made that Flourtown farm, was the Jersey cattle on it.

They said, Detrich make a lot of butter, but he puts tallow in it and he hauls hay there at night. What foolish people! When I was a boy, five or six of us would start after a wagon and the fellows would try to catch on. Just as soon as one fellow would succeed in catching on to the wagon, we would holler "Cut behind." Isn't that the story of life? You holler "cut behind" as soon as one man succeeds. I just like to strike a man who is full of growl; I don't think there is anything that digests victuals better for me than to hear some fellow growl.

Perhaps you ask me, "What do you mean by a cow for a dairy?" I mean a cow that is on a dairy farm, a cow that is good inside and outside. There are certain external marks that help us very much in selecting and handling a dairy animal. Go to see the best samples of breeding. Why does Mr. Cooper go to the Island of Jersey and bring these cattle over here? Why, it is a little bit of an island? That thing was mentioned by Prof. Van Norman a little while ago. The little Island of Jersey have two or three fairs a year, and when a calf is born, a committee goes to look after the calf and to see whether it ought to go to the butcher or into the dairy. They go around and pass judgment; they examine that calf from the tip of his nose to the tip of his tail, turn him over, and that is the way I always do. I look at that calf; study the individual.

You know there is any amount of men who have sons that don't fill any niche or position in this world. They simply stand before the front door and pick their teeth. There is nothing so unfortunate as that; nothing so unfortunate for a young man as not to make himself the captain of his own manhood. Unless he is the captain of his own manhood, he is something like one of these scrubby cows, fit neither for the butcher nor for the dairy, and yet man is designed to be a master of nature. That is what his intelligence is for, and if he would fulfill his mission on earth and creditably act his part among his fellow-men, he must rise to the opportunities that lie before him, as the first and only being that has any promise of existence after death.

What dairyman can afford to put fat on an animal's back at two cents and a half or three cents a pound when she can put butter in the bucket at twenty cents a pound. There is the dairy question and yet farmers are always talking beef. They call for beef and for tallow.

What we want to do about the breed is to select the breed you

want. If you want the Holstein breed, you are perfectly welcome to it. On the other hand, I want the Jersey cow, that will give cream for your coffee and for your strawberries, and it is that cow I want when I want quality. You can't make as good butter out of Holstein milk as you can out of Jersey milk. Why? Because the Holstein is bred for a different purpose.

A Member: Mr. Chairman, I would like to ask the Doctor a little further as to the feeding of corn.

DR. DETRICH: I spoke of feeding bran, linseed and cotton seed meal. I never feed corn meal; I never feed a pound of corn meal. I fed corn nubbins on one occasion that I told you about because they wouldn't eat other feed. I have found out that you must feed for two things, and I feed for the farm as well as for the milk product.

A Member: What proportion of gluten do you feed?

DR. DETRICH: That depends just on the cow when it comes to feeding. We start a frame with this mixed ration in it with linseed, cotton-seed, cut hay and ensilage. We feed a cow according to her production as near as we possibly can. Now we start this—we start it on a large truck, and take it right around, feeding the cattle right and left. If there is a cow here, she gets her regular proportion of this, but if she will take more feed and turn it into a product, we will give that cow an extra amount of grain. We will not put any more bran in it. We try to put the bran in as a basis, and then we cut it up with linseed.

If the manure is too loose, we will take the linseed and gluten meal; if the manure is not right, we will leave out the cottonseed and gluten meal and put in more linseed. I know that oats is just as good, but oats is too dear.

I think I have stated to-day or some place that a cow's udder follows the manure. If the cow's droppings are right, I will guarantee that her udder is right; you must get that cow's system right. The fact that she does not shed her coat, some cows will not, that cow will not milk as she should until her coat is right. Her whole circulation must be complete, and she must be in splendid physical condition; if you find your cow is not in proper condition, you can judge what is best for her.

Whatever a cow can eat up, and put in the bucket, it pays you to give her.

MR. MARTIN: Mr. Chairman, it is the expressed desire of nearly all the delegates that we adjourn this meeting so that a great number of us may take the 3.30 train this afternoon, and if we do that, it will be necessary to omit some of these addresses.

There are several numbers yet on this program, that of Dr. Warren on "The Enforcement of the Dairy and Food Laws," and then Prof. R. L. Watts' address on "Soil Improvement Without Stable Manures" and "Economy in Beef Production, by Prof. T. I. Mairs, of State College.

Dr. Warren is not present, but is represented here by Mr. H. L. Banzhoff. I have talked with Mr. Banzhoff, and he comes here prepared to occupy a few minutes in explanation of the work along

the line of Pure Foods. We would be pleased to have him speak a few minutes and then we will listen to Prof. Watts, with the understanding that we are to have the manuscripts of Mr. Banzhoff and of Prof. Mairs for publication in our proceedings.

Mr. Banzhoff, representing Dr. Warren, addressed the Normal Institute as follows:

## THE ENFORCEMENT OF THE DAIRY AND FOOD LAWS.

By MR. H. L. BANZHOFF, *Special Agent, Dairy and Food Division, Department of Agriculture.*

Mr. Chairman, Ladies and Gentlemen: Dr. B. H. Warren, Dairy and Food Commissioner, whom you have selected to speak to you on the subject—"The Enforcement of the Dairy and Food Laws" has been called to Washington, D. C., in consultation with President Roosevelt, in regard to the present meat investigation, and has requested me to speak to you on the above subject. Understand, however, not to take his place on the program, for this I am quite sure I would be unable to do, but I am glad, however, for this opportunity to meet with the representative farmers of the State of Pennsylvania, and, in greeting you, to give to you as briefly as possible on account of what is being done by the State in the direction of securing pure food.

The Pure Food Laws of the State of Pennsylvania, were enacted by the law-making body of our State, and signed by the Governor. These laws were not enacted to benefit a few, but for the protection of the masses. Yes, Mr. Chairman, I dare say to protect you and your family as well as every family that is represented here to-day from being forced to eat adulterated foods, or foods which contain preservatives, which are poisonous in nature and injurious to health. Did you ever think for a moment, when you sit down to partake of your meal, breakfast, dinner and supper, that you were unconsciously partaking of doses of chemicals, many of which are poisonous in their nature? I imagine I hear some one say, "Do you mean to tell me that there are manufacturers in the State of Pennsylvania as well as in all other states, that deliberately and knowingly use preservatives in the manufacture of foods which are absolutely poisonous in their nature and injurious to health?" To prove this fact, I call your attention to the first four thousand samples of various food products that were purchased under the direction of Dr. B. H. Warren, our Dairy and Food Commissioner, of which 82 per cent. of the same were sold in violation of the Pure Food Laws of the State, and proven by chemical analysis to be adulterated, while many were poisonous in character and injurious to health.

Let me call your attention to a few of these that your family and my family partake of daily: 1st. steak, or Hamburger steak, preserved with sulphites and colored with coal-tar dye. Fresh pork sausage, preserved with sulphites and colored with coal-tar dye. Bologna sausage, liver pudding, veal loaf, pressed ham, shredded cod fish, and many others that I might mention, preserved with boric acid and other ingredients injurious to health. Milk preserved with

formaldehyde, an important constituent of embalming fluid, which is used by the undertakers to prepare bodies after death, to preserve and keep them in a natural state for burial. In the city of Allegheny, in the year 1904, Special Agent Wilcox and myself purchased 49 samples of milk from the dealers, direct from their wagons as they were delivering to customers in the city. Out of these 49 samples, 28 were preserved with formaldehyde—this embalming fluid that I speak of, and three preserved with boric acid, and quite a number of the samples were skimmed and watered and low in fat. So you see that for the gain of the dollar, that the vendors in the city of Allegheny were not only willing to take chances in poisoning the innocent babies and invalids of that city who were forced to use milk as their only nourishment, but went a step further and robbed them by skimming and watering their milk.

Doubtless many of you have gone into a drug store on a hot summer day to get a refreshing drink. You step up to the soda fountain and ask for strawberry, raspberry or some other fruit flavor, thinking your drink was flavored with the natural fruit of the earth, when the facts were, that there was not a particle of the natural fruit in it, but simply a compound, with a coal-tar dye, preserved with salicylic acid and artificially flavored. One of the defendants in the courts of Allegheny county entered a plea of guilty, and said to his Honor, that he purchased the best syrups he could for the money. The Court in reply stated that if he could not purchase pure syrups to serve to his customers, he had better close down his fountain.

I also desire to speak to you in regard to some of the prepared fruits that are sold under the name of strawberry, raspberry, blackberry jam, etc., which contain but a very small percentage of the fruit; in fact, in a great many cases our chemists were unable to find even a trace of the natural fruit. These, too, were a compound of some inferior and cheaper substance than the natural fruit, colored with a coal-tar dye, artificially flavored and preserved with salicylic or benzoic acids.

I was informed by a traveling man, that he saw in one of our western cities, carloads of apple peelings and cores, and when he asked what they were going to do with this great amount of refuse, he was told that that was part of the strawberry, raspberry, blackberry and many other of the jams that he ate daily. So we might go on and speak to you of the many adulterations that we have found, tomato catsup, maple syrup, extracts of all flavors, shredded cocoanut, and vinegar. In this connection, I might say that I have purchased samples of vinegar for pure cider vinegar which did not have a trace of the apple juice in it; white wine vinegar that did not have a trace of the fruit in it. So I might go on and enumerate, but I think I have said enough to convince you that the makers of these food commodities are very little concerned about you or your health or the results from eating their bad food stuffs.

It seems to me all that concerns them is the dollar, or the profits they derive from their food stuffs, and they are willing to take all sorts of chances regardless of the Pure Food Laws of Pennsylvania. To prove that they are very little concerned about your health or my health in the sale of their production, very often it has been said when samples were taken and submitted to our Chemist for analysis

and found to be adulterated or preserved with a poisonous substance: "This has been a mistake of our shipper or our packer; these goods were not put up for the State of Pennsylvania but for some other state where the Pure Food Laws are not so vigorously enforced." So you can see, my friends, if it was not for the strict enforcement of the Pure Food Laws of our State, our markets would continue to be flooded with food products preserved with chemicals which would be poisonous in their nature and injurious to health; the facts are, we would be able to purchase but very little that would be true to name, pure, or as represented.

In regards to the enforcement of the Pure Food Laws of the State, let me quote to you the results of the work in Allegheny county from April 1, 1903, to May 7, 1906. Number of Pure Food cases prosecuted, 510; oleomargarine, 126; renovated butter, 44; a total of 680 cases prosecuted and finally adjusted. The amount of fines paid in Allegheny county during this period was $46,074.50, oleomargarine and renovated butter license, $77,439.16, making a grand total that has been remitted to the Department from Allegheny county alone of $123,513.66.

The result of the entire work of the Department is as follows: In 1903 there were 1,800 cases, in 1904, 1,517 cases; 1905, 1,085 cases. The amount paid in the State Treasury in 1903 was $93,458.71; 1904, $96,183.23; 1905, $82,467.60. Therefore, it is not necessary for me to consume any more of your time to try to convince you that the Pure Food Laws of the State of Pennsylvania are being vigorously enforced. I told you in the beginning, that of the first four thousand samples purchased under the present administration, which begun in the year 1903, that 82 per cent. of the samples were found to be adulterated, while to-day our chemists' reports show that the adulteration in the food stuffs is less than 10 per cent.

I want to speak to you briefly on the Oleomargarine Law and the enforcement thereof. Let me say to you in the first place, that there is not an oleo dealer in Allegheny county that does not understand the law. They not only make a close study of the law, but a very careful study of their local business, as well as every customer, and they are very suspicious of every new face. The facts are, the only encouragement they have to continue in the business is, that 75 per cent. of the people of Allegheny and surrounding counties are in favor of oleomargarine. One of the judges in that county in sentencing said, "He was only sorry that the minimum fine was not $10 instead of $100," but he was here to do his duty, and sentenced them to pay $100 in each case.

It may seem to those having no experience in running down violators of this law, that it is a very easy task. But as one who has had the experience, let me speak of a few of the methods that were used in procuring samples of oleomargarine. As I have stated before, the oleo dealers make a very close study of their local trade, and are very suspicious of every new face, therefore, it is necessary for the agents to adopt such methods that will throw the oleo dealer off his guard.

Sometimes the agent will appear in the garb of a coal miner, railroader, iron worker or a farmer; and many times the agent will visit the store from time to time and make purchases of food stuffs, until such time that the merchant feels he is a regular customer,

and has satisfied himself that he is not an agent of the State, then he will sell the agent oleo for butter. In one instance, I went into a store and asked for some butter, some cheap butter. The dealer said, "I have not got any of that cheap butter." He said, "My neighbor has it for sale. I have no license to sell it." I said, "Do you mean to tell me that butter is licensed like liquor in this State?" "Oh!" said he, "I see you are all right; how much do you want?" I said, "I will take three pounds." He reached under the counter and pulled out a good sized basketful of the genuine oleomargarine. These are but several of the many experiences of special agents in the field.

I want to say to you that Commissioner Warren and his force are not leaving a stone unturned in their efforts to rigidly enforce the pure food laws of the State of Pennsylvania. Where persons are caught violating the law, prosecutions are inevitable. The work of the Dairy and Food officials is sometimes discouraging, but it is gratifying to report that the time and energy expended has been productive of definite and unquestionably beneficial results. For the continued friendly support and encouragement received in the past, grateful acknowledgments are due and hereby cheerfully tendered, and especially since the active work now in progress in this State originated under the care and auspices of the State Board of Agriculture, of which honored body many of you claim membership and maintained constant loyalty to all that which is good and for the best interests of the people of this Commonwealth.

I thank you most cordially for your patience and attention in listening to these somewhat rambling and disconnected, but earnest and heartfelt expressions in behalf of pure food, and consequent better health.

The CHAIR: We will now take up the first number on our program for this afternoon entitled "Soil Improvement Without Stable Manures," by Prof. R. L. Watts, of Scalp Level, Pa.

Prof. Watts gave an address on the above subject, which for lack of time to prepare a copy, the same is not inserted.

The CHAIR: We will now take up the next number on the program, "Economy in Beef Production," by Prof. T. I. Mairs, State College, Pa.

PROF. MAIRS: Mr. Chairman, I feel a little bit out of place here this afternoon after hearing so much talk about the dairy cow; but I want to assure you that had I given my talk as contemplated, I should not have antagonized the dairymen in the least. It is not the purpose of the beef advocate to say anything against the dairy industry, but so many of us eat meat as well as milk and butter, that it is necessary that some of us produce that meat. Most of our meat is beef. Of course there are a great many vegetarians in the United States but they do not seem to have any very great influence as against the rank and file of the country. The consumption of meat does not seem to have been especially affected by the comparatively small number of vegetarians, who say that the consumption of meat makes us beastly and gives us all the attributes of wild animals, which are carniverous.

The questions which I was expecting to discuss here, are some of those which are connected with the production of beef, particu-

larly in Pennsylvania. As you know, most of our beef is grown in the West, but some of it is grown in Pennsylvania, and it was my intention to try to show you how we can increase our beef production in Pennsylvania and to give you some idea of some of the work that has been done at the Pennsylvania Experiment Station along this line.

We have been investigating some of the questions there concerning beef productions, particularly some questions that are most important to us in Pennsylvania where land is more valuable than it is in the West and where feed is more expensive, and where a closer account and a stricter economy must be observed in the work.

Owing to lack of time Prof. Mairs was unable to read his paper, but the same is herewith presented and is as follows:

## ECONOMY IN BEEF PRODUCTION.

By PROF. T. I. MAIRS, *State College Pa.*

In spite of the fact that the last few years has seen considerable agitation in favor of vegetarianism in many quarters, the American people continue to eat meat. It is safe to say also that the people of Pennsylvania eat their share. No amount of fanaticism will induce the American people to renounce their so-called flesh pots. Science and history unite in the proof that the natural food of mankind is of both vegetable and animal origin. Vegetarian nations have contributed practically nothing to civilization. Since our people must have meat the question naturally arises, where are they to get it? By far the larger amount of the fresh meat eaten has been and must continue to be beef. Can we in this State produce a larger amount of beef to advantage or can we produce it at less cost than at present? Is it advisable to undertake to increase our meat production? Can we compete successfully with western growers and feeders of beef cattle? If so, then it is to our interests to study the various problems involved in order that we may carry the work on to the best advantage. Shall we feed western cattle or natives? Shall the feeder raise his steers or buy them? What type will prove most profitable? At what age should they be fattened? What feeds should be fed? How should they be handled during the fattening period? If we are to produce beef, we should try to know, why, when, and how the business may be made profitable.

The process of beef production naturally divides itself into three operations: First, growing the animals, second, fattening, and third, marketing. In order that beef production may be carried on with the greatest profit, it is necessary that care and judgment be exercised at each step. In speaking of beef production or cattle feeding, we ordinarily think merely of the growing and fattening processes. Although these are the operations that involve the expenditures they are by no means the whole thing. While it is necessary to get the best animals possible at the lowest cost, and to fatten them with the least expenditure of food and labor, intelligent marketing is also essential.

The first thing to consider in selecting animals for beef production is the type. This is of importance both to the feeder and to the

butcher. The best type for the feeder is that animal which will put on the largest amount of flesh in the shortest length of time and with the least expenditure of feed, at the same time having such form and quality as will enable him to be marketed to advantage. The best animal for the butcher is one which will produce the highest percentage of net carcass with the largest proportion of high priced cuts. It is not always the case that the best animal for the butcher is the best one for the feeder. For butchers who are willing to discriminate between good and poor animals because they are able to make considerable difference in the price of different parts of the carcass, it pays the feeder to select animals more largely from a butcher's standpoint. On the other hand, if the butcher does not discriminate between the good and poor animals because he must sell all his meat at practically the same price per pound, it is to the advantage of the farmer to select only those animals which will put on the largest amount of flesh and put it on most rapidly.

The type of animal best adapted for beef production is low, blocky, rectangular in shaps with short neck, short legs, loose mellow skin, firm elastic flesh and quiet, gentle disposition. Such an animal will sell for the highest price in the market when properly fattened. Animals of the pony type are to be avoided; they are usually not profitable feeders because they do not gain well; although they may sell for a good price when marketed. The narrow backed, flat sided animal with long slender neck and thick hide will not take on flesh rapidly and even when fat, does not appear so.

A heavy, mossy coat of hair is an indication of good powers of assimilation. Short and even hair indicates a delicate constitution, rough and staring coat indicates poor digestion, while a coat of long dead hair would indicate a stunted period of some time in life.

The man who ships to a large center can afford to pay more attention to the type of animal selected and can pay a higher price in order to obtain the desired type than can one who feeds for the local butcher. The local butcher in general is not able to make much distinction in price between choice and ordinary animals.

Table I is intended to show why the local butcher can usually afford to pay more for a common animal than the city packer, but cannot pay relatively so much for the prime steers. The local butcher must obtain a higher price for his meat because he cannot sell the by-product to so good advantage. This table has been for the most part computed from figures furnished by Swift & Co.

Comparison of Retail Price of Beef in Chicago and in Country Town.

| Cut. | 1,200 Pound Steer. | | | | | 1,000 Pound Cow. | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Local. | | Chicago. | | | Local. | | Chicago. |
| | Weight. Pounds. | Price. Cents. | Cost. Dollars. | Price. Cents. | Cost. Dollars. | Weight. Pounds. | Price. Cents. | Cost. Dollars. | Cost. Dollars. |
| Prime of rib, | 79.2 | 14 | 11.08 | 18 | 14.25 | 43.3 | 14 | 6.06 | ..... |
| Porterhouse, | 100.8 | 17 | 17 13 | 22 | 22.17 | 61.4 | 17 | 10.43 | ..... |
| Sirloin, | 37.3 | 17 | 6.34 | 18 | 6.71 | 22.7 | 17 | 3.85 | ..... |
| Rump, | 29.8 | 12 | 13.57 | 10 | 2.98 | 22.1 | 12 | 2 65 | ..... |
| Round, | 132.2 | 16 | 21.15 | 10 | 13.22 | 98.1 | 16 | 15.69 | ..... |
| Sum, | 379.3 | ..... | 59.29 | ..... | 59.34 | 247.6 | ..... | 38.70 | ..... |
| Neck, | 9.0 | 8 | .27 | 2.5 | .18 | 14.4 | 8 | 1.15 | ..... |
| Plate, | 84.7 | 8 | 6.99 | 4 | 3.49 | 57.7 | 8 | 4.61 | ..... |
| Flank, | 24.6 | 8 | 1.96 | 4 | .98 | 14.5 | 8 | 1.16 | ..... |
| Chuck, | 180.5 | 12 | 21.66 | 6 | 10.83 | 127.4 | 12 | 15.28 | ..... |
| Skin, | 19.8 | 10 | 1.98 | 3 | .59 | 19.2 | 10 | 1.92 | ..... |
| Shank, | 22.1 | 10 | 2.21 | 3 | .66 | 19.2 | 10 | 1.92 | ..... |
| Sum, | 340.7 | ..... | 35.30 | ..... | 16.75 | 252.4 | ..... | 26.05 | ..... |
| Total, | 720.0 | ..... | 95.82 | ..... | 76.09 | 500 | ..... | 65.76 | 37.70 |

A good 1,200 pound steer will net 60 per cent. while a 1,000 pound common cow will net only 50 per cent. More than half the meat of the steer is in the high priced cuts, less than half of that of the cow. This table shows that whereas the Chicago retailer and the local butcher get practically the same for the high priced cuts of a good steer, the local dealer gets $35.53 for the low priced ones which the Chicago dealer must sell for $16.75, or less than half as much. Assuming that the steer cost five and a half cents per pound and the cow three cents the profit to the local butcher was $35.82 or about 60 per cent. on the steer and $35.76 or 119 per cent. on the cow. The profit to the Chicago butcher would be $16.10 or about 27 per cent. on the steer and $7.50 or 25 per cent. on the cow. The local butcher gets two-thirds as much for the low priced cuts as for the high priced ones. He can thus afford to pay more for the common stock than the city butcher can. The local butcher on the other hand cannot pay so much for the better animal because he can make more profit off the common ones and because he cannot realize so much on the by-products. Thus some animals can be sold to best advantage in a small town, others in large markets.

Whether the farmer should buy his animals or raise them is largely a question which each man must decide for himself. If pasture is plentiful and convenient it will usually pay to raise the animals. It frequently takes some months for the western animals to become acclimated and recover from the injurious effects of the long car ride. It may thus be found more profitable to raise the animals than to buy them from the West, even if western animals of the same size and quality can be had a few dollars cheaper than the natives. Another advantage in favor of the feeder raising his own calves is that he has complete control of them from the day

they are born, and the younger the animal the greater the gain for food consumed.

The age at which animals are fed has a great deal to do with their powers of assimilation. The younger the animal in general the less the cost of production. Professor H. R. Smith in his recent book on "Profitable Stock Feeding," gives the following figures: "Averaging six different trials when accurate records were kept of gains and cost of food it is found that during the first twelve months each 100 pounds of increase in live weight costs $3.45; the second twelve months in the same animal $7.42; and the third twelve months $11.50."

At the Illinois Experiment Station a carload each of range bred calves, yearlings and two-year-olds were fed. At the beginning of the experiment the calves averaged 384 pounds, the yearlings 784 pounds, and the two-year-olds 1,032 pounds. The net cost of 100 pounds of gain was $4.10 on the calves, $5.60 on the yearlings and $6.60 on the two-year-olds.

The profits in beef production, however, consist not alone in the increased weight of the animal but also in the enhanced value of the original carcass. Thus if an eight hundred pound animal costs four cents a pound and after being fattened sells for five cents a pound there is a profit of eight dollars on the original carcass. On the other hand, if the animal had originally weighed a thousand pounds, this profit would have been ten dollars so there is an advantage in favor of beginning with larger animals. This difference might easily be offset, however, by the greater age of the larger animal.

Where animals are grown for fattening the greatest profit will nearly always be found in fattening as young as possible. If western animals are to be fed it will usually be found more profitable to feed the larger ones, as long yearlings or two-year olds, on account of the greater margin afforded by the heavier original weight.

The young animals are producing muscles and other living tissues as well as fat. At the same time the carcass of the young animal contains a higher percentage of water so that less food is required for a pound of gain then than after the animal becomes older. The muscles contain on the average about 66 per cent. water. Therefore only one-third of the gain in muscle must be made from the food eaten. On the other hand, the fatty tissue contains only about 10 per cent. water and must therefore be produced almost entirely from the food. As the animals grow older, cell activity decreases, growth is not so rapid and the water-content diminishes. Young animals, therefore, require a greater per cent. of protein and can use it to better advantage than older ones.

While muscle-producing foods may cost a little more per pound, they will often be cheaper than those capable of producing fat alone. Animals intended for beef production, should always be fattened while growth is still active. Growth continues up to four or five years although of course it is more rapid while younger, while in general it may be said, the younger the animal the more nitrogenous its ration; of course there is a possibility of making it too nitrogenous to be profitable. Protein for maintenance and for growth is all that is required. Any excess only goes to produce heat or fat and for that purpose it is too expensive. It seems to matter little

whether the protein is derived from the grain or the roughage. Corn fed with a leguminous hay seems to give fully as good results as corn and oil meal or cotton-seed meal fed with timothy hay or corn stover. The animal that has enough protein in its food and is young enough to make a good growth will not get patchy when fattened like the one that is older or is fed on a less nitrogenous ration.

In producing beef animals from common cows, the bull is considerably more than half the herd. The more the cows depart from the beef type the stronger the bull should incline toward it. This does not mean that a beef bull bred to high grade Jersey cows will produce profitable beef steers; he will not. Such breeding will always result in a loss. But the cow that is a heavy milker with a tendency to lay on flesh when dry, will produce a good steer when crossed with a beef sire. Whatever else is done the dual purpose sire should be avoided. The dual purpose cow may be all right, but the dual purpose steer has no place in the feed lot. When beef animals are wanted, a beef sire should be used; when dairy animals are wanted, a dairy sire should be used; if scrubs are wanted, a dual purpose sire will answer the purpose.

It is not safe to use any but a pure bred sire. He should be a good individual, well bred but not necessarily fashionably bred. It would not pay to put $500 into a bull for a herd of twenty-five grade cows, but it probably would pay to put in $100 rather than $50. The calves would have to be worth only $2.00 more per head to have the difference returned the first year. A high grade bull that is a good individual and whose breeding is known to be good may be better than a pure bred scrub, but such an animal is not often found; his breeding is usually unknown. Entirely too many of the bulls in this State are just bulls, without form and void. Like the proverbial mule, they are without pride of ancestry, but they certainly have hope of posterity so far as numbers are concerned. It is no wonder steers do not pay. There is too much competition at present to permit of spontaneous breeding being profitable. It takes no more feed to raise a good animal than a poor one; it may not take as much. It does take a little more intelligence.

According to the twelfth census, the farmers of Pennsylvania spend annually almost $5,000,000 for commercial fertilizers. This is more than is spent in any other state except Georgia. A large amount of this could be saved by feeding the crops out on the farm and properly caring for the manure. Pennsylvanians are depending too much upon the West to supply their animals. They ship in their beef from Chicago, their pork from Buffalo, and their horses from St. Louis. It is a well known fact that fattening animals return a higher per cent. of the fertilizing constituents in their food than any other class. In an experiment at the Pennsylvania Experiment Station and published in Bulletin No. 63, 86.63 per cent. of the nitrogen, 82.98 per cent. of the phosphoric acid, and 93.95 per cent. of the potash in the food and litter of fattening steers was recovered in the manure. The actual amount recovered in any instance will depend upon the method of feeding and of handling the manure.

Tests made at the same station and published in the same bulletin, show that there is much less loss in manure with steers kept in pens or box stalls, where the manure is allowed to accumulate under them and is trampled into a compact layer, than with those kept

tied up in stanchions or stalls which must be cleaned out daily even when the manure removed is stored under shed. One of the conclusions of this test was that, "The money-value of the fertilizer constituents lost by the second as compared with the first method is equivalent to $2.50 for each steer stabled for six months."

While this difference may seem small it is undoubtedly worth considering where fertilizers must be bought, especially since the trampled manure seems to be in better mechanical condition.

There is yet another advantage in the pen or box stall over the stanchion; that is in the saving of labor. The question of labor is always an important one. In no manner can the crops be fed with so little labor as to beef animals. One of the advantages which beef production has over milk production is in the less amount of labor required. A man can tend to fifty fattening steers as easily as to ten milk cows. The steers can be handled with much less labor if kept in pens or large stalls of from ten to twenty each than if kept tied up. They can be kept cleaner in the pens with less labor. They can be fed more quickly and much or little bedding may be used as desired.

Two tests were made at the Pennsylvania Experiment Station to compare the amount of time required to care for steers confined by these two methods. In the first test with five steers in each lot it appeared that it required about one-fifth more time to care for steers tied up than for those loose in pens. In the second test with ten steers in the pen and six tied up it appeared that 100 steers tied required as much labor as 180 loose in pens. The gains in live weight and the consumption of food were practically the same for each lot. The results of these two experiments have been published in Bulletins Nos. 53 and 57.

It does not pay, therefore, to fasten the steers up with stanchions and chains. The greater expense for the equipment for the method is also against it. The practice of tying originated when steers wore horns and it was then necessary for the safety of both cattle and feeder, but now when everything is dehorned, the need no longer exists. A man buying cattle for feeders should refuse all that have their horns on. If he raises them of course he will dehorn them while they are young.

Warm quarters are not necessary for steers when being fattened. Experiments at Pennsylvania State College reported in Bulletins Nos. 64 and 74, have indicated that temperature of surroundings has very little to do with the economy of gains. In fact it has been proved that there is much more liability of basement stables being too warm than too cold for fattening steers. Open sheds well ventilated with a small dry yard attached are fully as satisfactory as barns. The cost of such sheds would of course be much less.

The preparation of the feed always requires some labor and expenditure. Even if the farmer raises his own corn it has usually been thought that it is not economy to feed it unground, but recent experiments at the Pennsylvania State College indicate that broken ear corn is about as valuable as corn and cob meal for fattening steers. Where the farmers lives some distance from the mill, the time lost hauling the corn to and from there is quite considerable. The miller will seldom grind for less than $2 per ton. The ear corn may be broken as fed for a much less expenditure than that. A

man will easily break a ton of ears in less than three hours. It has been argued as an advantage in favor of grinding that cotton-seed meal or oil meal can be mixed readily with ear corn. While this is true it has been found just as satisfactory to put cotton-seed meal on top of the broken corn as to mix it with it. In this way the feed will be fairly well mixed by the cattle when eaten. Another advantage in favor of broken corn is that a greater amount of the undigested corn will be recovered by hogs if they have access to the steers. Where corn must be shipped in, it of course will be shelled on account of the freight. It might be better ground as the steers will not chew the shelled corn so well as the broken ears.

These are but a few of the questions connected with beef production, and they have been touched upon but briefly. It is not recommended that every one engage in the business or that it become as general as it is further west, but it is a profitable method of marketing corn, of utilizing pasture and of converting straw into fertilizer.

It is on the increase on some of the highest priced lands in the State, a fact which would indicate its profitableness. It is doubtful whether summer feeding is advisable, except for young animals, preferably natives. But that we can produce baby beef and fatten more steers to advantage is firmly believed.

On motion, the Normal Institute adjourned.

A. L. MARTIN,

*Deputy Secretary of Agriculture and Director of Institutes.*